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Fenestra

floor and roof panel systems

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PRODUCTS FOR THE NEW AGE IN ARCHITECTURE

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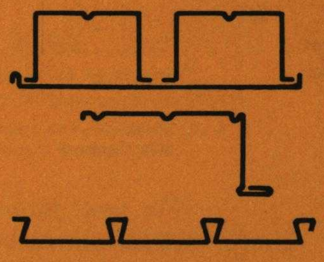
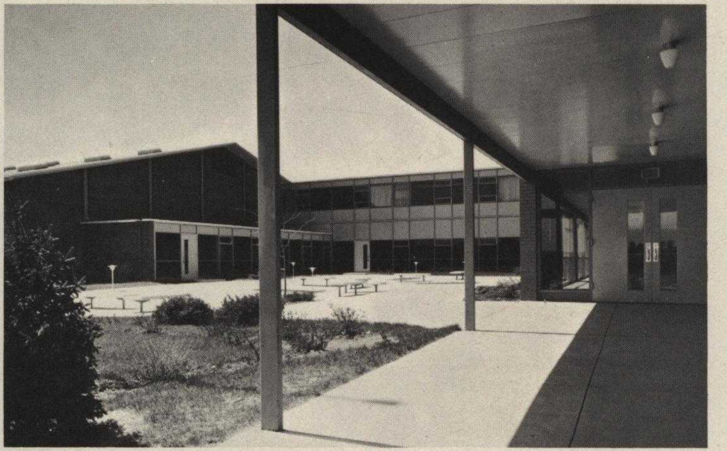
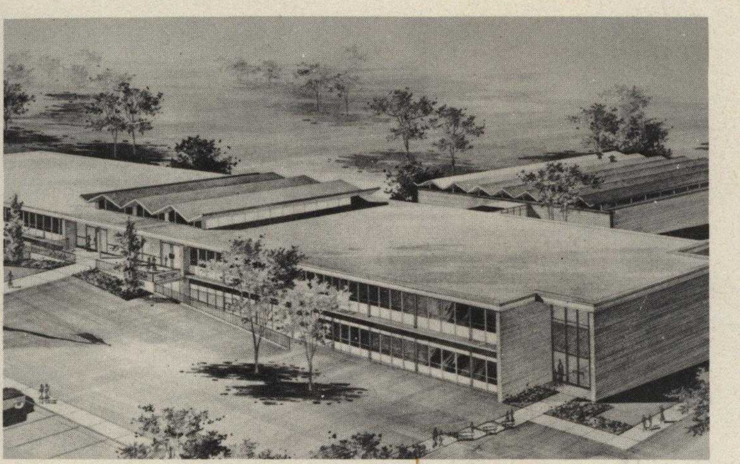


Fenestra presents . . .



Millard Jr. and Sr. High School—Millard, Nebraska
Architect—Donald R. Hollis
Material—372 squares of "D" Panels, 61 squares of Deck, 95 Fenmark Curtainwall Units.



Fort Crook Elementary School—Bellevue, Nebraska
Architect—Martin, Money and Assoc.
Material—128 squares of "D" Panel Folded Plate, 268 Fenmark Curtainwall Units.

For your further design needs in building construction, we suggest you refer to the following catalogs on other related Fenestra Building Products in Sweet's Architectural File.

The multiphase utilization of Fenestra Architectural Products, as well as specialized design data, is presented in the following publications, available on request:

Fenestra Curtain Wall Systems	AP-11
Lateral Diaphragm Design	BP-40
Fenestra Fentura Roof System	BP-41
Folded Plate Design	BP-42
Fenestra D Panel Roof System	BP-43
FenMark II, Curtain Wall System	CW 21
FenMark III, Load Bearing Curtain Wall	CW 61
Lighting System for Fenestra Roof Panels	EM/F61

For your further design needs in Wall Panel or Curtain Wall construction, we suggest you refer to the Fenestra Wall Panel Systems catalog in Section 17A, Sweet's Architectural File.

Electrified floor systems

Fenestra now provides two types of electrified floor systems to meet varying design and tenant requirements.

(1). The Fenestra "D" panel construction is a 100% electrically available floor. It is a complete cellular system for unlimited electrification demands.

(2). The Holorib Elect-Re-Form is an economical "blend" system which supplies the exact number of services required.

"D" panel Roof systems

Designed and engineered upon the principles of cellular formed-beam type construction, Fenestra's "D" Panel systems offer the designer his selection of the construction types shown opposite to meet the particular job requirements involved.

Any one of a number of different requirements may be the reason for using Fenestra Cellular Steel Building Panels. For instance, a school classroom building may require acoustical panels spanning 34′-6″ from wall to wall; a gymnasium, supermarket, or bowling alley may require column free roofs with spans up to 120 ft.; a new or existing building may require a mezzanine of lightweight construction or canopies of modern design or cantilevered. These are but a few of the objectives easily attained through the use of Fenestra Building Panels.

"LS" and "E" deck panels

"LS" deck is the most unique and versatile long span steel roof deck available. This economical construction combines a maximum of architectural freedom, acoustic variation, lighting arrangements and simplified engineering.

"E" deck is a medium span roof deck, providing "beamed" ceiling effect. Excellent for canopies, covered walkways and special uses with "D" panels.

Holorib and Econorib deck

Holorib roof deck is the original quality deck, with many other related applications developed over years of usage.

Econorib is Fenestra's V-rib deck. It has slightly less strength capacity than Holorib but retains many of its quality features.

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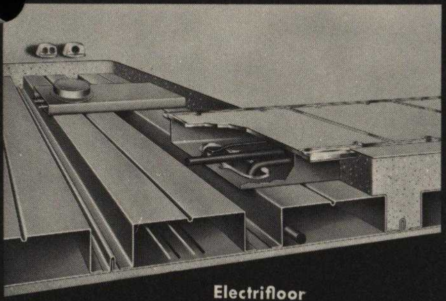
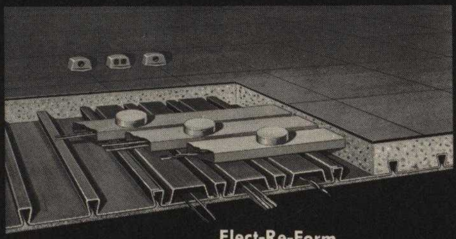

Electrifloor


Elect-Re-Form

Electrified floor systems

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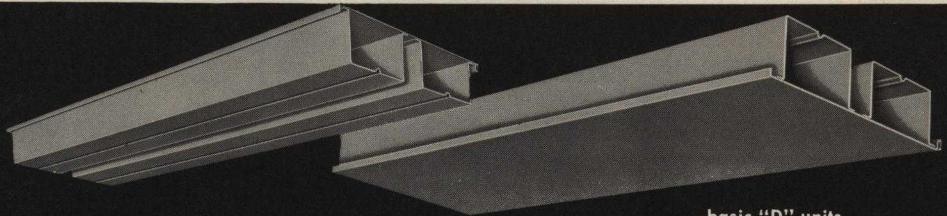
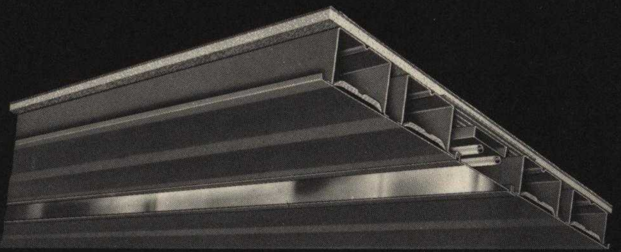

basic "D" units


acoustical

Roof panels

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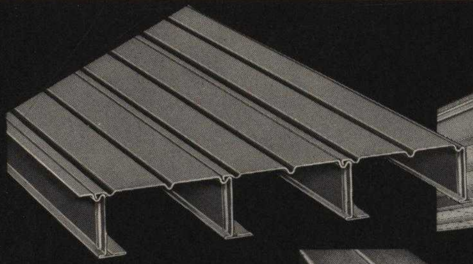
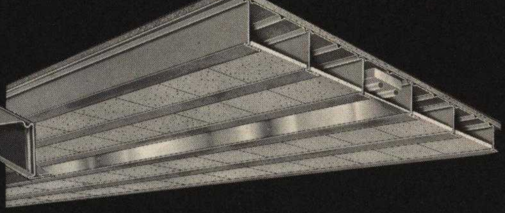
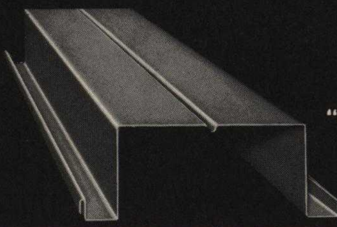

"LS" deck


Fentura roof system


"E" deck

"LS" deck

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"E" deck

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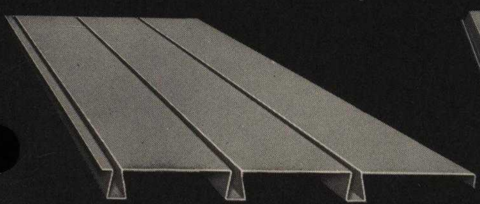
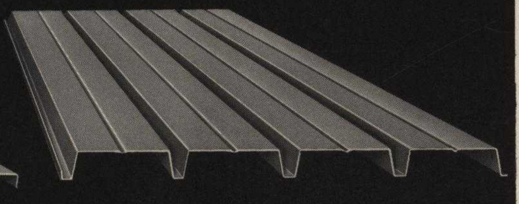

Holorib


Econorib

Holorib and Econorib decks

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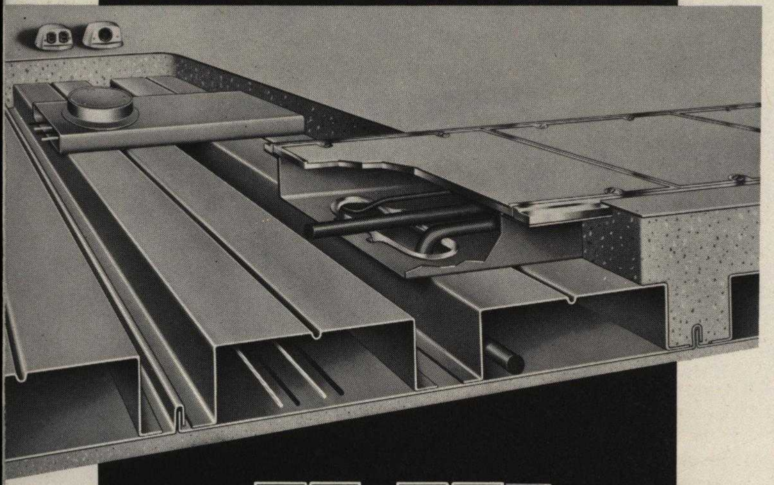
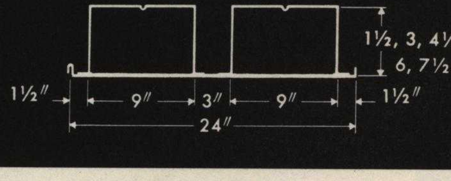
"D" panel *Electrifloor*

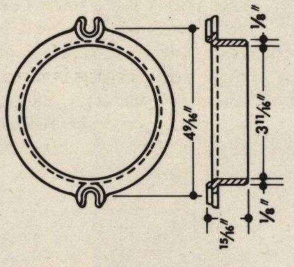




Maximum Cell Area

3″	-27 sq. inches
4½″	-41 sq. inches
6″	-54 sq. inches
7½″	-68 sq. inches

Access Unit. The access unit into the header duct provides a large junction box for ease of pulling and splicing. The wide flat surface of the Fenestra cell permits a 4″ opening from the bottom of the access unit into the cell. This allows the installer to actually reach into the cell and also provides the larger opening required to facilitate the bending of large diameter telephone cables. This 4″ opening is large enough for 16 - 26 pair cables.



Electrifloor & Holorib
Allen Towers Inc.—New Orleans, La.
Archt.—Shaw, Metz, Dolio—Chicago, Ill.
Contr.—Crane Const. Co.—Chicago, Ill.

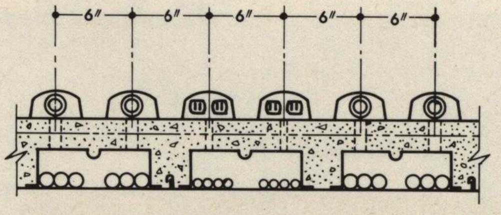
"D" Panel Electrified for 100% Electrical Availability

Fenestra "D" Panel construction is a 100% electrically available floor raceway system. Cellular steel Fenestra Panel utilizes box beam construction both as the structural unit and as a electrical underfloor distribution system. This latter is accomplished by addition of a header duct system and floor fittings as furnished by UL approved electrical manufacturers. Fenestra "D" Panel Electrifloor is fully approved by Underwriter's Laboratories, Inc.

Flat Plate Construction. Panel design provides flat plate undersurface permitting minimum thickness and costs of direct spray-on fireproofing. Also provides a rib of concrete every 12″ to minimize deflection and aid in stiffness of the floor. Aids in preventing sound transmission from floor to floor. Also provides shielding from adjacent cells.

Exceptionally Large Duct Area. Panel cells are 9″ wide by the required design depth. For example, a 3″ deep panel has 27 sq. in. of area per cell. These large size cells facilitate the handling of large diameter telephone cables and ease the pulling of a large number of wires. This large cell can be used as a homerun. Cell areas will be large enough to handle future needs as well as present. Telephone cables can lay flat, identified by colored tape, easily viewed through 4″ dia. handhole & left in place for future use when disconnected.

Flexibility and Availability. Floor outlets can be provided anywhere at any time for power and light, telephone and intercommunication systems. Because of the large width of the cell, service fittings may be offset from the center line permitting 6″ spacing between outlets for a two-service system if so desired. The wide duct area gives minimum header duct cost through decreased handholes per foot of length while giving access to every cell. 75% of the floor area is energized.



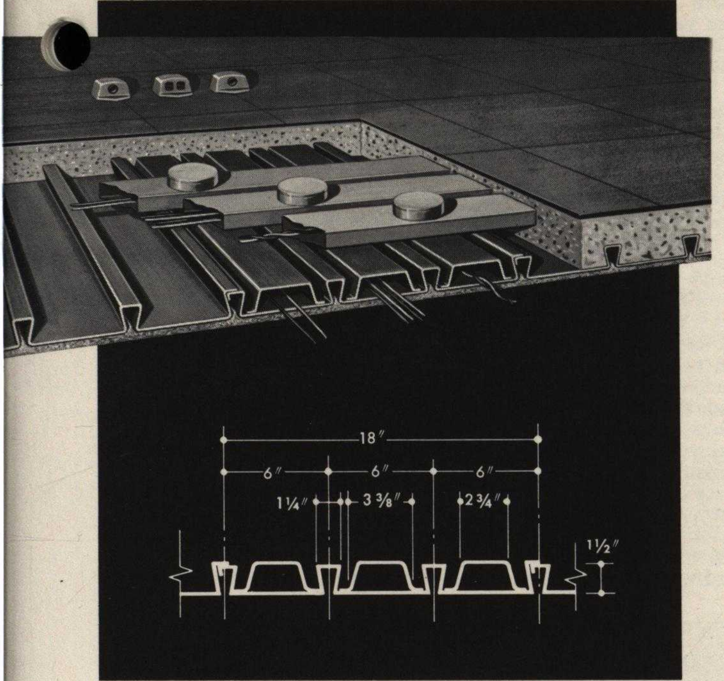
fire resistance "D" panels

For directly applied fireproofing installations, the flat plate of Fenestra D Panels is chemically cleaned and phosphated to provide an adhesion strength greater than the cohesive strength of the fireproofing materials. Test reports are available.

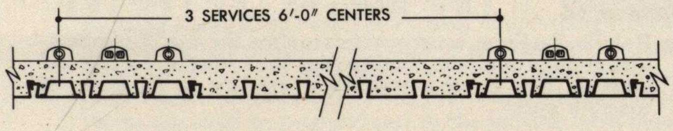
DIRECTLY APPLIED FIREPROOFING	
Thermacoustic, 1½″	5 hours UL-R3431
Spraycraft, ⅝″	3 hours UL-R2923
Vermiculite Acoustical plastic, 1″	4 hours UBC*
Asbestospray Type "T", ⅝″ ½″	4 hours UBC 3 hours UBC
Cafco Spray, ⁹⁄₁₆″	4 hours FPRI**
Pyro-coustic, ¾″	4 hours FPRI**
SUSPENDED CEILING	
Mineral Wool Tile ⅝″	2 hours UL-R4337-11
Perlite-gypsum plaster ⅞″	4 hours UL-R3355
Vermiculite-gypsum plaster ¾″	3 hours UBC

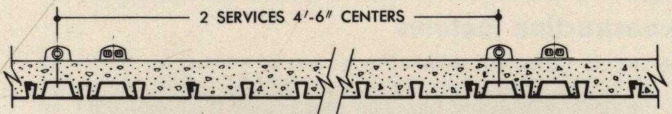
*Uniform Building Code of the International Conference of Building Officials.
**Fire Prevention Research Institute.

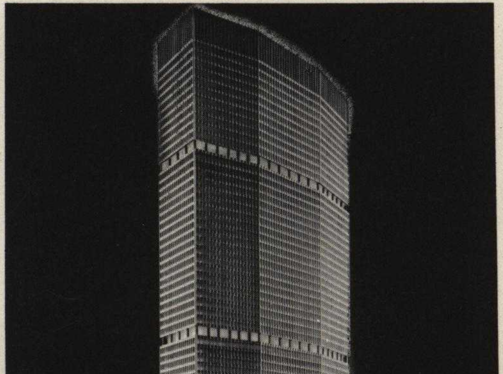
Holorib Elect-Re-Form



Elect-Re-Form is a natural extension of the Holorib concept. Channel-shaped cells are placed and welded between the sides of Holorib Reinforcing Floor Forms to provide cellular units for electrification. Intermittent sheets of plain Holorib Reinforcing Floor Form are interlocked between to provide a "blended system" of variable space and capacity requirements. Elect-Re-Form is fully approved by Underwriters' Laboratories and will accommodate all standard electrical fittings.





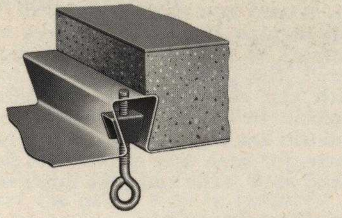


Elect-Re-Form
Pan-Am Bldg., New York City, N.Y.
Archt.—Emery Roth—New York City
Contr.—Diesel Const. Co. Inc.—New York City

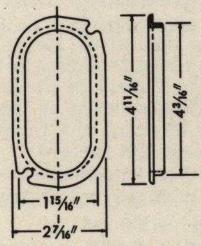
Elect-Re-Form Features

Where economy is essential but electrification is a highly desirable "Extra," Fenestra Holorib Elect-Re-Form systems permit the choice of the most exact layout obtainable. Since, one, two, or three cells may be located in any pattern, on any 6″ module the ultimate in economy and flexibility is possible. No more paying for dead cells is required just for the sake of standards or structural requirements. Holorib Elect-Re-Form permits shallow 4″ slab floor thickness, high load capacity, up to 12′-0″ spans, and economical fireproof ceiling design for 2 and 3 hour ratings at only pennies more per square foot than the basic structural system itself.

Another unique advantage of Holorib Re-Form and Elect-Re-Form, made possible by the exclusive rib configuration, is the provision for a simplified hanger assembly. Unlike competitive anchoring systems, the Fenestra hanger clip requires no drilling, welding, extra channels or other accessories. In fact, the clip can be installed just as easily after the concrete has been poured allowing more freedom in the planning and placement of suspended equipment such as ceilings, lights, ducts and pipes. With a load capacity of 255 lbs./assembly, independent of deck gage, the Fenestra hanger assembly fulfills all normal suspension requirements.



Access from the header duct cells to the Elect-Re-Form cells is secured by means of standard holes at junction units. Installation of header duct and fittings is made in the same manner as for Electrifloor "D" panels. Concrete fill to a depth of 2½″ above the ribs completes the floor construction.

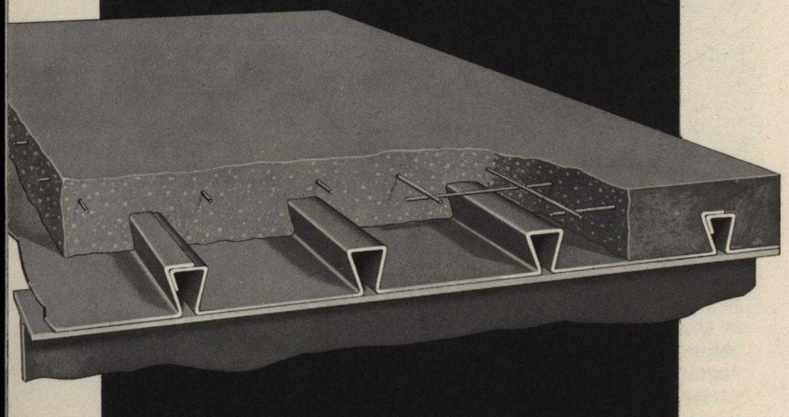


fire resistance

When fire ratings are required for Holorib Re-Form—Elect-Re-Form blend construction, they may be obtained through the use of conventional suspended plaster ceilings or directly-applied fireproofing. Following is a summarized description of a directly-applied fireproofing method tested at Underwriters' Laboratories:

Vermiculite Acoustical Plastic Underside thickness Re-Form Areas —¾″ Elect-Re-Form Areas—1″	3 hours UL R-3355
Spraycraft (Smith & Kanzler) Underside Thickness Uniform 9/16″	3 hours UL-R-2923
"Firecode" Plaster (U.S. Gypsum Co.) Underside Thickness Elect-Re-Form & Re-Form Areas —¾″ Header Duct Areas—1″	3 hours UL R-4142-7
Cafco Sprayed Fiber Underside Thickness Reform Areas & Elect-Re-Form—⅜″	2 hours ULC CR200-6 60T97

Holorib Re-Forms



general description

Fenestra galvanized steel Holorib, installed with the ribs up, is used as a reinforcing form for concrete slabs. Used in this manner the Holorib serves not only as a form for the support of the wet concrete, but after the concrete has cured, the pyramidal-shaped ribs, combined mechanically with the concrete, provide sufficient bond to allow the Holorib to act as positive reinforcement for the concrete. Holorib has been used successfully in this manner for many years, for such uses as concrete floors, balcony steps, arena seats, stair wells and pipe ducts or trenches.

engineering data

The design of Holorib Re-Form construction is based on standard formulas for one-way rectangular, reinforced concrete slabs, and checked by extensive testing.

Development of the allowable live load table was done on the basis of the forementioned formulas using the following design factors:

$f'_c = 3{,}000$ psi $E_c = 1000f'_c = 3{,}000{,}000$ psi
$f_c = 0.45f'_c = 1350$ psi $f_s = 18{,}000$ psi
$u_c = 60$ psi $E_s = 30{,}000{,}000$ psi
$v_c = 0.02f'_c = 60$ psi $n = E_s/E_c = 10$
Σ_o = Total perimeter of ribs/ft.width
A_s = Cross Sectional Area of the Holorib Sheet/ft. width.

Results of tests conducted at leading universities substantiate the use of the above design factors. Copies of test reports are available upon request.

Adequate venting of the slab, as proven by tests, is provided by the normal side and end lap engagements. Other tests have shown that temperature variations as much as 80°F have no effect on the bond of the concrete to Holorib.

In the development of the allowable live load table, the least allowable load as governed by concrete or steel resisting moment, bond stress or shear stress was selected as the table value.

allowable live loads

Total Slab Thickness	2½″	3″	3½″	4″	4½″	5″
Wt. of Slab Per Sq. Ft.	31.25	37.50	43.75	50.00	56.25	62.50
Span	Live Load (pounds per square foot)					
5′-0″	295	371	451	530	610	690
5′-6″	266	334	406	477	550	621
6′-0″	241	303	369	433	499	564
6′-6″	208	276	337	396	457	516
7′-0″	175	254	310	364	420	475
7′-6″	148	223	286	337	388	439
8′-0″	127	191	266	312	360	407
8′-6″	109	165	231	291	336	380
9′-0″	93	143	201	266	306	347
9′-6″	81	124	176	233	269	306
10′-0″	70	109	154	206	238	270
10′-6″		95	136	182	210	237
11′-0″		84	120	162	187	211
11′-6″		73	106	144	166	188
12′-0″			94	128	148	167

design data

In addition to the use of the allowable live load table, the following points must also be considered, in the design of Holorib Reinforcing Floor Forms for varying job conditions:

- The values in the table are valid only for 16, 18 or 20 gage galvanized Holorib used with sand-gravel or sand-crushed stone concrete having an ultimate compressive strength of 3000 psi or greater.
- The values in the table are based on simple span conditions. When Holorib Re-Forms are used over double or continuous spans, negative reinforcement may be omitted and the simple span load values used. Where negative steel is required by code, continuous span or shored conditions, the design for negative moment follows standard reinforced concrete design procedure.
- The values in the table are for superimposed, uniform, static loads. The weight of the slab only has been deducted from the allowable total load. Additional dead loads, such as ceilings, light weight partitions, etc., must be subtracted from the Table value to determine the final allowable live load. Concentrated loads must be converted to an equivalent uniform load, considering some distribution by the concrete, which shall not exceed the moment and reaction conditions of the table. Heavy moving and/or impact loads are to be avoided.
- Values in the load table are based only on stress conditions. Consideration for control of deflection must be made in accordance with generally accepted methods.
- Temporary shoring is required on spans greater than those tabulated below. Requirements for shoring are based on the weight of the wet concrete. If an additional construction load is imposed, shoring shall be increased accordingly.

allowable spans without shoring

Type Span	Gage	TOTAL SLAB THICKNESS					
		2½″	3″	3½″	4″	4½″	5″
Simple	20	8′-0″	7′-6″	7′-0″	7′-0″	6′-6″	6′-6″
	18	9′-0″	8′-0″	8′-0″	7′-6″	7′-0″	7′-0″
	16	9′-6″	9′-0″	8′-6″	8′-0″	7′-6″	7′-6″
Double	20	8′-6″	8′-0″	7′-6″	7′-0″	6′-6″	6′-6″
	18	9′-0″	8′-6″	8′-0″	7′-6″	7′-6″	7′-0″
	16	9′-6″	9′-6″	9′-0″	8′-6″	8′-0″	7′-6″
Continuous	20	9′-0″	8′-6″	8′-0″	7′-6″	7′-6″	7′-0″
	18	9′-6″	9′-0″	8′-6″	8′-0″	8′-0″	7′-6″
	16	10′-0″	10′-0″	9′-6″	9′-0″	9′-0″	8′-6″

- Holorib Re-Form construction requires the use of temperature mesh to minimize crackage due to shrinkage and thermal stresses. This is considered good practice in all types of concrete work.

construction features

- **SPEEDS CONSTRUCTION**—Forms can be erected for the entire structure as soon as steel framework is in place, providing immediate working platform and protective staging for all trades.
- **INTERNAL REINFORCING**—Holorib forms provide all necessary positive reinforcing. The pyramidal ribs key into the concrete giving a positive bond. Temperature mesh is required to minimize shrinkage cracking.
- **STRUCTURAL BRACING**—Holorib reinforcing forms, welded in place, provide extra lateral bracing for the structural frame.
- **ECONOMY**—The reinforcing value of the Holorib form and the savings in labor over removable forms results in the most economical type of reinforced concrete slab installation.

composite construction

Past reference to Holorib Reinforcing Form considered its working with concrete to provide composite slab action.

Now, in recent design, the concrete slab, (reinforced by the Holorib) works also with the steel beam to provide composite beam design; saving in depth and weight of steel required.

To work together, bonding the slab to the beam is necessary through shear connectors. Many types of shear connectors are available from continuous spirals to steel channels and angles; however, the best for field application are *Nelson Studs* which can be applied through access holes in the Holorib Deck punched prior to erection between the pyramidal ribs and over the beam flange. This facilitates steel and deck erection.

The broad, flat area, (5½″) between ribs, gives a greater area of concrete in contact with the beam top flange and roots of the stud weld than provided by decks with small corrugations.

Being able to punch out this large flat area allows continuous and longer spans without shoring.

specifications

basic "D" panel floor system

1. GENERAL—All floor areas noted on plans shall be covered with Fenestra Building Panels as manufactured by Fenestra Inc.

2. MATERIAL—Type "D" Building Panels shall be formed from: three galvanized steel sheets conforming to Federal Specification QQ-S-775a for *Class e* galvanizing and designated in the following nomenclature: (Insert Depth) D (Insert gage of flat plate and position U or D) Galv. (Insert gage of beam section) Galv.

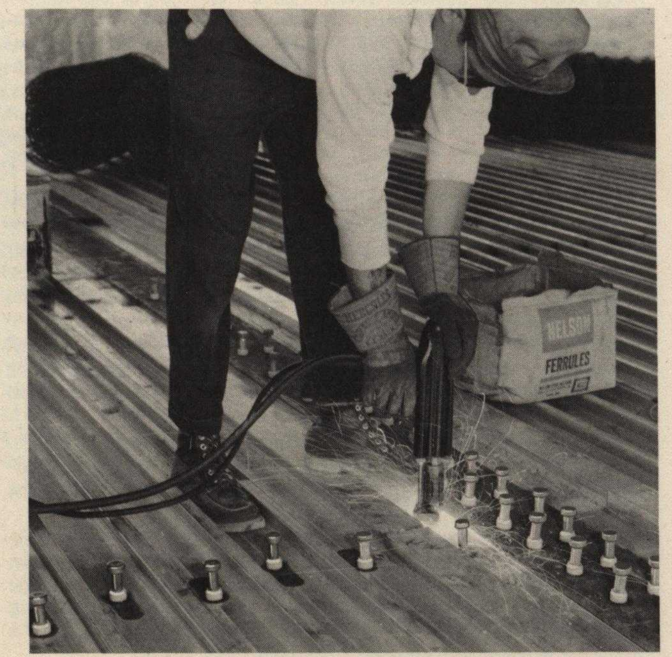
Example—4½ D-16U (Galv.) 16 (Galv.)

3. CONSTRUCTION—Type "D" Building Panels shall be composed of two identically formed beam sections, with an integral stiffening rib rolled into the top flange of each section, and a flat plate. The flat plate shall have formed male and female joints on opposite edges. The flat plate and the beam sections shall be assembled by electrical resistance spot welding to provide a structural cellular-beam panel. Side joints shall be interlocking (male-female) and continuous for the length of the section. The panels shall be 24″ in width and of depth as designated in **2. MATERIAL** above.

4. SHOP FINISH—Galvanized Panels shall be furnished with phosphate treated flat plates.

5. DESIGN—The building panel shall be capable of carrying the specified total loads with a maximum fiber stress not to exceed (20,000) (18,000) (insert stress) psi on actual thickness of metal. Maximum allowable deflection under live load shall not exceed 1/360 of the span length. Design load (dead load + live load) shall be taken from contract drawings without allowance for impact. Panel design is to be in accordance with the American Iron and Steel Institute's "Specification for the design of Light Gage Cold-Formed Steel Structural Members, 1962."

Building Panel Floors shall be capable of providing continuous bracing for the compression flange of all horizontal supporting members such as beams, girders, arches and trusses, so that the compression flange can carry the full design stress. Welding of the panels shall be proportioned to the bracing force required.



A composite design floor using Fenestra Holorib and Nelson Stud Shear Connectors.

6. ERECTION—(a) Building Panels—(To be furnished by Fenestra Inc. and installed by deck erector.) All building panels shall be laid in strict accordance with manufacturer's instructions and as shown on layout prepared for erector's use. Steel panel units shall be adjusted in place before being permanently fastened and shall be accurately aligned, end to end, to permit registration of cellular beam portions of the unit. Inaccuracies in alignment or level of structural steel shall be brought to the attention of the proper parties and corrected by others before steel panel units are finally placed. In accordance with shop details, proper bearing shall be provided at supporting beams.

Steel Panels shall be fastened to each supporting beam with three ½″ fillet welds per panel end. Longitudinal side joints between adjacent panels shall be joined by welding with ¾″ length welds 4′-0″ on center or by riv-clinching 3′-0″ on center, as specified by erection drawings. All welding shall be electric arc welding performed by competent welders. All welds upon cooling shall be given a touch-up coat of paint.

7. WORK TO BE INCLUDED IN OTHER CONTRACTS

(a) Painting—The touch-up of scuffs and abrasions due to transit or erection, the touch-up charred points on the underside of the welds, as well as the field paint to the exposed surface of painted steel or galvanized steel panels, shall be under the general painting specifications.

(b) Steel Framing—(1) All structural steel and structural steel attachments required to support the panels shall be furnished by the steel contractor. All steel framing shall be erected in conformance with tolerances set forth in AISC Standard Code of Practice.

(2) Where panels cannot be brought to bear on steel work at columns or other points of unusual conditions, adequate support for the panels shall be furnished by designated contractor.

(c) Concrete—(Architect shall provide specifications for concrete fill having a minimum ultimate compressive strength of 2500 psi for "D" Panel floor areas).

It is recommended that the concrete fill be placed in as dry a condition as is practical to minimize shrinkage. It is further recommended that temperature mesh, 6 x 6-10/10 or heavier, be used to minimize cracking of the concrete due to shrinkage and thermal stresses. The temperature mesh shall be positioned at mid-depth of the fill.

(d) Miscellaneous—(1) All trades whose work involves the cutting of holes, reinforcing or drilling the panels shall furnish all work and labor necessary and at the cost of that trade whose work is affected. All such work shall be done in strict accordance with building panel manufacturer's instructions.

(2) At the option of the various sub-contractors whose work involves the cutting of holes, reinforcing or drilling the panels, the building panel contractor shall furnish all work and labor necessary only during the time of his work at the job site, at the cost to the sub-contractor whose work is affected and at prices to be agreed upon by both parties.

electriflor

Follow specifications for Type "D" Panel with the following exceptions:

Under **1. GENERAL** substitute:

All floor areas, as noted on plans, intended to provide for the distribution of under floor wiring, shall be constructed of Underwriters' Laboratories' approved Type "D" Building Panels as manufactured by Fenestra Inc.

Under **2. MATERIAL** omit **(a)** and add the following:
Closures shall be provided to close ends of all cells unless closed by masonry.
Closures shall be provided for covering the gap between butting floor panels.

Under **4. SHOP FINISH** omit **(a)** add following to **(b)**:
Panel flat plate, if fireproofing is to be directly applied, shall be chemically cleaned to remove oil, grease and other foreign matter and immediately following shall receive a hot phosphate surface treatment which converts the surface of the metal to a crystalline layer of insoluble salts of phosphoric acid for the purpose of improving the bond between fireproofing material and the galvanize.

Under **6. ERECTION** substitute:
All building panels shall be laid in strict accordance with manufacturer's instructions and as shown on layout prepared for erector's use. Steel panel units shall be adjusted in place before being permanently fastened and shall be accurately aligned, end to end, for the length of the run of cells to permit registration between ends of the cellular beam units used as a continuous electrical raceway. Inaccuracies in alignment or level of structural steel shall be brought to the attention of the proper parties and corrected by others before steel panel units are finally placed. In accordance with shop details, proper bearing shall be provided on supporting beams.
Panels shall be fastened to end supporting beams with three ½" fillet welds per panel end. At intermediate supporting beams, weld the panels to the beams with one ¾" puddle weld per panel. Longitudinal side joints between adjacent panels shall be joined by welding with ¾" length welds 4'-0" on center or by riv-clinching 3'-0" on center. All welding shall be electric arc welding performed by competent welders. All welds upon cooling shall be given a touch-up coat of paint.
Closures provided for closing the gap between butting floor panels shall be attached temporarily until inspection by the electrical contractor, after which the electrical contractor shall permanently secure these to the panels by welding and caulking.

Under **7.** add:

(e) Electrical Work

1. The electrical contractor shall inspect all cells then permanently attach and caulk all cover plates.

NOTE: (For specifications regarding the header duct and other electrical items, consult the header duct manufacturer.)

lateral bracing

Follow specifications for Type "D" Building Panels with the following exceptions:

Under **6. ERECTION** add:
(b) Welds shall be placed as determined by the Lateral Bracing design under Section 5 of this Specification.

lateral diaphragm

Follow specifications for Type "D" Building Panels with following exception:

Under **5. DESIGN** add:
(b) The building panel installation shall be designed to utilize the continuous, joined flat plate of the panels as a diaphragm to resist horizontal shear forces. The recommended working shear, per foot, shall be (insert appropriate system value from the table, page 12, in accordance with panel flat plate position).

(c) The panel installation details shall be in accordance with (insert appropriate system number and designation corresponding to the above recommended working shear as described and detailed on pages 12 and 13.

Under **6. ERECTION** omit 2nd paragraph of **(a)** and add:
(b) Building panels shall be installed in accordance with the design portion of this specification.

Holorib Re-Form and Elect-Re-Form System

1. GENERAL—All areas noted on the plans shall be covered with Holorib Re-Forms or Elect-Re-Form as manufactured by Fenestra Incorporated.

2. MATERIAL—Holorib Re-Form shall be formed of (**select gage**) 16, 18 or 20 USS Gage Steel sheets conforming to (select coating) (Federal Specification QQ-S-775a *Class e*) (the manufacturers standard Galvclad finish).
Elect-Re-Form unit base sheet and cell sections shall be formed, respectively, of 16 and 18 gage steel sheets conforming to ASTM Standard A-245 or A-246 and having a galvanize coating conforming to Federal Specification QQ-S-775a *Class e.*

3. CONSTRUCTION—Holorib Re-Form shall have integral pyramidal shaped ribs, all continuous and complete in cross section, and spaced not more than 6" on center. Ribs shall be formed to a depth of not less than 1½", with an opening of not more than ½" at the apex and a width of not less than 1¼" at the base. Side laps shall be positively registering full depth side lap ribs placed in a manner to prevent the flow of concrete through the joints.
The bottom of the sheets shall form a substantially flat and continuous surface.
Elect-Re-Form units shall consist of the Holorib Re-Form section to which (select number) 1, 2 or 3 trapezoidal cell sections shall be attached by spotwelding to provide a continuous raceway. The cell sections shall have a depth of 1½" and a top flange width of 2¾".

4. DESIGN—Holorib Re-Form construction shall be capable of supporting the specified uniform loads in accordance with the allowable live load table and design factors shown in the Fenestra Floor and Roof Panel System Catalog.

5. ERECTION—Holorib Re-Form sheets shall be laid in strict accordance with the manufacturer's instructions and as shown on a layout prepared for the erector's use. At the end laps of the sheets attach the sheet to supporting members with puddle welds, one adjacent to each of the outside ribs. At intermediate supports attach the sheet to the supporting member with one puddle weld adjacent to the center rib.
Side joints shall be joined by welding with ½" fillet welds at supports and at midspan for spans 4'-0" to 6'-0". For spans over 6'-0" weld joints at supports and at third points of the span.

6. WORK TO BE INCLUDED IN OTHER CONTRACTS—Concrete for Lolorib Re-Form construction shall conform to the following specifications.

a. Base Preparation—Prior to concreting, the surface of the sheets shall be cleaned of all debris, grease, oil and other deleterious substances to the satisfaction of the contractor and/or architect's representative.

b. Materials and Mixture—(Architect shall provide specifications for cement, fine and coarse aggregates, water-cement ratio and mixing for concrete providing an ultimate compressive strength of 3000 psi.)
It is recommended that the specified mixture shall have a slump of from 4 to 5 inches, insuring sufficient moisture in the concrete to allow optimum bonding of the concrete to the galvanize surface and minimized shrinkage.
It is further recommended that no admixtures containing calcium chloride or other chloride salts shall be used in the mixture.

c. Reinforcement—Shrinkage and thermal stress reinforcement in the form of welded wire mesh and type suitable for the depth of the slab shall be placed at approximately mid depth of the slab.

d. Placement of Concrete—Concrete shall be placed in accordance with the American Concrete Institute's "Building Code Requirements for Reinforced Concrete" (ACI 318-56) Section 404.

e. Curing—After placement, the concrete shall be allowed to cure, without being loaded, until it reaches an ultimate compressive strength of 3000 psi. Curing shall be done in accordance with good concrete curing practice.

f. Shoring—When required, in conformance with the allowable shoring table in the Fenestra Floor and Roof Panel System Catalog, Holorib Re-Form shall be temporarily shored. The design of the shoring shall be in accordance with local building code provisions. The shoring shall be left in place until the concrete attains 70% design compressive strength.

engineering data

selecting a Fenestra floor or roof panel section

Designing a Fenestra floor or roof panel follows the procedure for any structural section. It is necessary to consider such items as the type of structure, type and degree of loading, span provisions, end bearing, ceiling conditions and electrical wiring requirements.

The following data will enable the designer to select a cellular steel structral floor or roof panel. Most of the computation work normally required has been reduced to tabular form to simplify the selection of the panel.

1—load and span

A roof or floor section must satisfy two basic requirements:

(a) Strength—indicated by Section Modulus "S."

(b) Deflection Resistance—indicated by Moment of Inertia "I."

The individual job and use of the panel will determine the dead and live load values. These are to be specified by the architect or designer and it is beneficial to have the values appear on the contract drawings. In addition, the architect will specify the type ceiling which will dictate the deflection criteria, normally 1/360 of the span for plastered ceilings and 1/240 of the span for unplastered ceilings. Partition loads must be considered individually—normally as an additional uniformly applied dead load over the entire floor area, unless specifically included in the live load allowance. (Check local or state codes for accepted practice.)

For ease of selecting the proper and most economical panel section to satisfy these two conditions, the Minimum Required Section Property Table and the Panel Section Property Table have been prepared. The Minimum Required Section Property Table should be entered at the proper stress criteria (18,000 or 20,000 psi), total load and span values and the minimum required section modulus (S) value determined. The AISI allows use of a 20,000 psi design stress; however, some codes still require use of an 18,000 psi stress. Similarly, the live load, span and deflection criteria will determine the required moment of inertia (I) value.

With these values recorded, select from the Panel Section Property Table, a panel which has both the Section Modulus and Moment of Inertia equal to or greater than the required values. The Moment of Inertia of the panel selected must correspond to the basic design stress used. In most cases you will find two or more panels that will satisfy these minimum conditions. You are then able to select the lightest weight panel, as that will be the most economical. If depth consideration is important, use a shallower panel with the least additional weight in order to gain both the depth advantage and the weight advantage.

2—web strength values

In light gage panel design, it is also necessary to check for web strength after the basic panel has been determined from load and span conditions. The web strength values are given in the Panel Section Property Table and are for 12" widths and 3" bearing, the same as section property values. These values have been determined through tests conducted by the American Iron and Steel Institute and are in full accordance with their accepted specification. The following formula has been adopted by the American Iron and Steel Institute in order to consider all variables such as depth of the panel section, gage of the web, steel design stress and length of bearing.

$$P = 100t^2 \, [980 + 42\,(B/t) - .22\,(B/t \times h/t) - .11\,(h/t)]$$

t = gage thickness (inches)
h = panel depth (inches)
B = length of bearing (inches)
P = Allowable Load/web/reaction

Web strength/ 12" section including both end reactions =
$4P = C$, For 24" Wide Panels
C equals Fenestra Web Strength Values

To check for web strength, multiply the span in feet by the total load in lbs./sq. ft. This resultant total load per foot of floor width, should be checked against the Web Strength Values. The Web Strength Values should be equal to or exceed this total load for satisfactory design. If it does not, the next heavier gage web should be used. For example, 150#/sq. ft. total load on a 10' span gives 1500#/ft. of width which the tables show can be sustained by an 18 gage web or heavier.

3—lateral diaphragm design

Pertains to seismic, wind and bomb shock loadings. For further information see pages 12 and 13 of this catalog and Fenestra's brochure BP-40.

4—lateral bracing

Pertains to the stiffening of the compression flange of a beam. This should not be confused with Lateral Diaphragm Design.

design suggestions

1. Concrete is not considered in any strength computation of a Fenestra panel section; however, as in any thin concrete slab, a mesh is necessary to minimize concrete crackage. The mesh should be placed at mid-height in the slab for greatest effect.

2. Light Weight Concrete—due to the many possible varieties and ingredients of this type of concrete, it is recommended individual companies be consulted concerning the proper specification for the use of this material with steel floor panels.

3. The fewer variations in depth and gages of panels on a particular job, the greater the benefits in coordination, erection and handling.

section property tables

Panels may be used with the flat plate up or the flat plate down. Based on the position in which it is used, the section property of the panel differs.

1. All section properties have been determined by use of American Iron and Steel Institute's Specifications for Design of Light Gage Cold-Formed Steel Structural Members, and confirmed by test.

2. All properties are based on a 12" width of panel, although the panels are 24" wide.

3. Allowable total (dead and live) load per square foot is computed by dividing coefficient of strength by span (in feet) squared.

4. Allowable live load per square foot is computed by dividing coefficient of deflection by span (in feet) cubed when 1/360th deflection governs. If 1/240th deflection governs, the coefficient of deflection for 1/360th can be multiplied by 1.5.

5. Recommended bearing is 3 inches for floors and roofs.

6. The nomenclature system quickly describes the panel. The first numeral designates the depth of panel; the letter following indicates the type of panel; the first gage number shows the gage of the flat plate; the letter immediately following tells the position of the flat plate (U for up, D for down); the final numeral gives the gage of the hat section. Thus: 3 D-16D-14 is the designation for a panel of 3 inch depth, of type "D," 24" width, with a 16 gage flat plate placed down and a 14 gage hat section.

7. Panel section properties should be reduced 10% when all of the panels in a given area are acoustically treated.

Panel section properties should be reduced 5% for all of the panels in a given area when an alternating (50% plain—50% acoustic) system is used.

engineering data (continued)

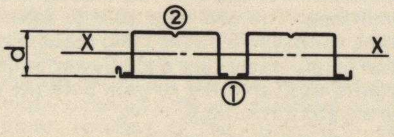
minimum required moment of inertia

SPANS	I VALUES	20	30	35	40	45	50	55	60	70	80	90	100	120	140	160	180	200	220	240	INCREMENT PER LB.
		live loads in pounds per square foot																			
8′-0″	L/360	.23	.35	.41	.47	.53	.59	.64	.70	.82	.94	1.05	1.17	1.41	1.64	1.87	2.11	2.34	2.57	2.81	.0117
	L/240	.16	.23	.27	.31	.35	.39	.43	.47	.55	.62	.70	.78	.94	1.09	1.25	1.40	1.56	1.72	1.87	.0078
9′-0″	L/360	.33	.50	.58	.67	.75	84	.92	1.00	1.17	1.34	1.50	1.67	2.00	2.34	2.67	3.01	3.34	3.67	4.01	.0167
	L/240	.22	.33	.39	.44	.50	.56	.61	.67	.78	.89	1.00	1.11	1.33	1.55	1.78	2.00	2.22	2.44	2.66	.0111
10′-0″	L/360	.46	.69	.80	.92	1.03	1.15	1.26	1.37	1.60	1.83	2.06	2.29	2.75	3.21	3.66	4.12	4.58	5.04	5.50	.0229
	L/240	.31	.46	.54	.61	.69	.77	.84	.92	1.07	1.22	1.38	1.53	1.84	2.14	2.45	2.75	3.06	3.37	3.67	.0153
11′-0″	L/360	.61	.92	1.07	1.22	1.37	1.53	1.68	1.83	2.14	2.44	2.75	3.05	3.66	4.27	4.88	5.49	6.10	6.71	7.32	.0305
	L/240	.41	.61	.71	.81	.91	1.02	1.12	1.22	1.42	1.62	1.83	2.03	2.44	2.84	3.25	3.65	4.06	4.47	4.87	.0203
12′-0″	L/360	.79	1.19	1.38	1.58	1.78	1.98	2.17	2.37	2.77	3.16	3.56	3.95	4.74	5.53	6.32	7.11	7.90	8.69	9.48	.0395
	L/240	.53	.79	.92	1.06	1.19	1.32	1.45	1.58	1.85	2.11	2.38	2.64	3.17	3.70	4.22	4.75	5.28	5.81	6.34	.0264
13′-0″	L/360	1.01	1.51	1.76	2.01	2.26	2.52	2.77	3.02	3.52	4.02	4.53	5.03	6.04	7.04	8.05	9.05	10.06	11.07	12.07	.0503
	L/240	.67	1.01	1.17	1.34	1.51	1.68	1.84	2.01	2.35	2.68	3.02	3.35	4.02	4.69	5.36	6.03	6.70	7.37	8.04	.0335
14′-0″	L/360	1.26	1.88	2.20	2.51	2.83	3.14	3.45	3.77	4.40	5.02	5.65	6.28	7.54	8.79	10.05	11.30	12.56	13.82	15.07	.0628
	L/240	.84	1.26	1.47	1.68	1.89	2.10	2.30	2.51	2.93	3.35	3.77	4.19	5.03	5.87	6.70	7.54	8.38	9.22	10.06	.0419
15′-0″	L/360	1.54	2.32	2.70	3.09	3.47	3.86	4.25	4.63	5.40	6.18	6.95	7.72	9.26	10.81	12.35	13.90	15.44	16.98	18.53	.0772
	L/240	1.02	1.55	1.80	2.06	2.32	2.58	2.83	3.09	3.61	4.12	4.64	5.15	6.18	7.21	8.24	9.27	10.30	11.33	12.36	.0515
16′-0″	L/360	1.87	2.81	3.28	3.75	4.22	4.69	5.15	5.62	6.56	7.50	8.43	9.37	11.24	13.12	14.99	16.87	18.74	20.61	22.49	.0937
	L/240	1.25	1.88	2.19	2.50	2.81	3.13	3.44	3.75	4.38	5.00	5.63	6.25	7.50	8.75	10.00	11.25	12.50	13.75	15.00	.0625
17′-0″	L/360	2.25	3.37	3.93	4.50	5.06	5.62	6.18	6.74	7.87	8.99	10.12	11.24	13.49	15.74	17.98	20.23	22.48	24.73	26.98	.1124
	L/240	1.50	2.25	2.63	3.00	3.38	3.75	4.13	4.50	5.25	6.00	6.75	7.50	9.00	10.50	12.00	13.50	15.00	16.50	18.00	.0750
18′-0″	L/360	2.67	4.00	4.67	5.34	6.00	6.67	7.34	8.00	9.34	10.67	12.01	13.34	16.01	18.68	21.34	24.01	26.68	29.35	32.02	.1334
	L/240	1.78	2.67	3.11	3.56	4.00	4.45	4.90	5.34	6.23	7.12	8.01	8.90	10.68	12.46	14.24	16.02	17.80	19.58	21.36	.0890
19′-0″	L/360	3.14	4.71	5.49	6.28	7.06	7.84	8.63	9.41	10.98	12.55	14.12	15.69	18.83	21.97	25.10	28.24	31.38	34.52	37.66	.1569
	L/240	2.09	3.14	3.66	4.19	4.71	5.24	5.76	6.28	7.33	8.38	9.42	10.47	12.56	14.66	16.75	18.85	20.94	23.05	25.13	.1047
20′-0″	L/360	3.66	5.49	6.40	7.32	8.24	9.15	10.06	10.98	12.81	14.64	16.47	18.30	21.96	25.62	29.28	32.94	36.60	40.26	43.92	.1830
	L/240	2.44	3.66	4.27	4.88	5.49	6.10	6.71	7.33	8.55	9.77	10.99	12.21	14.65	17.09	19.54	21.98	24.42	26.86	29.30	.1221
21′-0″	L/360	4.24	6.36	7.42	8.48	9.54	10.60	11.65	12.71	14.83	16.95	19.07	21.19	25.43	29.67	33.90	38.14	42.38	46.62	50.86	.2119
	L/240	2.83	4.24	4.94	5.65	6.36	7.06	7.77	8.48	9.89	11.30	12.72	14.13	16.96	19.78	22.61	25.43	28.26	31.07	33.91	.1413
22′-0″	L/360	4.87	7.31	8.53	9.74	10.96	12.18	13.40	14.62	17.05	19.49	21.92	24.36	29.23	34.10	38.98	43.85	48.72	53.59	58.46	.2436
	L/240	3.25	4.86	5.69	6.50	7.31	8.12	8.94	9.75	11.38	13.00	14.63	16.25	19.50	22.75	26.00	29.25	32.50	35.75	39.00	.1625
23′-0″	L/360	5.57	8.35	9.74	11.14	12.53	13.92	15.31	16.70	19.49	22.27	25.06	27.84	33.41	38.98	44.54	50.11	55.68	61.25	66.82	.2784
	L/240	3.71	5.57	6.50	7.43	8.36	9.28	10.21	11.14	13.00	14.86	16.71	18.58	22.28	26.00	29.71	33.43	37.14	40.85	44.57	.1857
24′-0″	L/360	6.33	9.49	11.07	12.65	14.23	15.81	17.40	18.98	22.14	25.30	28.47	31.63	37.96	44.28	50.61	56.93	63.26	69.59	75.91	.3163
	L/240	4.22	6.33	7.38	8.44	9.50	10.55	11.60	12.66	14.77	16.88	18.99	21.10	25.32	29.54	33.76	37.98	42.20	46.42	50.64	.2110
25′-0″	L/360	7.15	10.72	12.51	14.30	16.09	17.86	19.66	21.45	25.02	28.60	32.18	35.75	42.90	50.05	57.20	64.35	71.50	78.65	85.80	.3575
	L/240	4.77	7.15	8.34	9.54	10.73	11.92	13.11	14.30	16.70	19.07	21.46	23.84	28.61	33.38	38.14	42.91	47.68	52.45	57.22	.2384
26′-0″	L/360	8.04	12.06	14.07	16.08	18.09	20.10	22.12	24.13	28.15	32.17	36.19	40.21	48.25	56.29	64.34	72.38	80.42	88.46	96.50	.4021
	L/240	5.36	8.05	9.39	10.73	12.07	13.41	14.75	16.09	18.77	21.46	24.14	26.82	32.18	37.55	42.91	48.28	53.64	59.00	64.37	.2682
27′-0″	L/360	9.01	13.51	15.76	18.01	20.26	22.52	24.77	27.02	31.52	36.02	40.53	45.03	54.04	63.04	72.05	81.05	90.06	99.07	108.07	.4503
	L/240	6.01	9.01	10.51	12.02	13.52	15.02	16.52	18.02	21.03	24.03	27.04	30.04	36.05	42.06	48.06	54.07	60.08	66.09	72.10	.3004
28′-0″	L/360	10.05	15.07	17.58	20.09	22.60	25.12	27.63	30.14	35.16	40.18	45.21	50.23	60.28	70.32	80.37	90.41	100.46	110.51	120.53	.5023
	L/240	6.70	10.05	11.72	13.40	15.06	16.75	18.42	20.10	23.45	26.80	30.15	33.50	40.20	46.90	53.60	60.30	67.00	73.70	80.40	.3350
29′-0″	L/360	11.16	16.74	19.53	22.32	25.11	27.90	30.69	33.48	39.06	44.64	50.22	55.80	66.96	78.12	89.28	100.44	111.60	122.76	133.92	.5580
	L/240	7.44	11.17	13.03	14.89	16.75	18.61	20.47	22.33	26.05	29.78	33.50	37.22	44.66	52.11	59.55	67.00	74.44	81.88	89.33	.3722
30′-0″	L/360	12.36	18.53	21.62	24.71	27.80	30.89	33.98	37.07	43.25	49.42	55.60	61.78	74.14	86.49	98.85	111.20	123.56	135.92	148.27	.6178
	L/240	8.24	12.36	14.42	16.48	18.54	20.60	22.66	24.72	28.84	32.96	37.08	41.20	49.44	57.68	65.92	74.16	82.40	90.64	98.88	.4120
31′-0″	L/360	13.63	20.45	23.86	27.26	30.67	34.08	37.49	40.90	47.71	54.53	61.34	68.16	81.79	95.42	109.06	122.69	136.32	149.95	163.58	.6816
	L/240	9.09	13.64	15.91	18.18	20.46	22.73	25.00	27.28	31.82	36.37	40.91	45.46	54.55	63.64	72.74	81.83	90.92	100.01	109.10	.4546
32′-0″	L/360	14.99	22.49	26.24	29.99	33.74	37.48	41.23	44.98	52.48	59.98	67.47	74.97	89.96	104.96	119.95	134.95	149.94	164.93	179.93	.7497
	L/240	10.00	15.00	17.50	20.00	22.50	25.00	27.50	30.00	35.00	40.00	45.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	.5000
33′-0″	L/360	16.44	24.67	28.78	32.89	37.00	41.11	45.22	49.33	57 55	65.78	74.00	82.22	98.66	115.11	131.55	148.00	164.44	180,88	197.33	.8222
	L/240	10.97	16.45	19.19	21.94	24.68	27.42	30.16	32.90	38.39	43.87	49.36	54.84	65.81	76.78	87.74	98.71	109.68	120.65	131.62	.5484
34′-0″	L/360	17.99	26.98	31.48	35.97	40.47	44.96	49.46	53.96	62.95	71.94	80.94	89.93	107.92	125.90	143.89	161.87	179.86	197.85	215.83	.8993
	L/240	12.00	17.99	20.99	23.99	26.99	29.99	32.99	35.99	41.99	47.98	53.98	59.98	71.98	83.97	95.97	107.96	119.96	131.96	143.95	.5998
35′-0″	L/360	19.62	29.43	34.34	39.24	44.14	49.05	53.96	58.86	68.67	78.48	88.29	98.10	117.72	137.34	156.96	176.58	196.20	215.82	235.44	.9810
	L/240	13.09	19.63	22.90	26.17	29.44	32.72	35.99	39.26	45.80	52.34	58.89	65.43	78.52	91.60	104.69	117.77	130.86	143.95	157.03	.6543

●Constants for selection of required moment of inertia for odd spans not covered in table on this page.

Span (L) in feet (w=Live Load) in pounds per sq. ft.

$I=.00002288wL^3$ I=(L/360 of span criterion) (All floors; and roofs with suspended ceiling)
$I=.00001526wL^3$ I=(L/240 of span criterion) (All roof with no suspended ceilings)
$I=.0000007627wL^4$—(1″) Maximum recommended live load deflection for spans over 20′-0″
$I=.0000006102wL^4$—(1¼″) Maximum recommended live load deflection for spans over 30′-0″



panel section properties (per 12″ width)

24″ wide double hat "D" panel—flat plate down

NOM. DEPTH	GAGE (SECTION NUMBER) 1	GAGE (SECTION NUMBER) 2	WT. PER SQ. FT. LBS.	ACTUAL DEPTH IN.	AXIS X—X— f=20,000 "I" IN.^{4}	AXIS X—X— f=20,000 COEF. OF DEFLEC. L/360	AXIS X—X— f=18,000 "I" IN.^{4}	AXIS X—X— f=18,000 COEF. OF DEFLEC. L/360	"S" IN.^{3}	COEFFICIENT OF STRENGTH f=20,000	COEFFICIENT OF STRENGTH f=18,000	WEB STRENGTH VALUES PER 3″ BEARING
1½	18D	18	4.4	1.60	**.52**	22880	**.53**	23320	**.43**	5730	5160	2920
1½	16D	18	4.9	1.61	**.56**	24640	**.57**	25080	**.43**	5730	5160	2920
1½	16D	16	5.5	1.62	**.73**	32120	**.74**	32560	**.62**	8270	7440	4040
1½	14D	14	6.9	1.66	**.99**	43560	**1.02**	44880	**.93**	12400	11160	5560
3	18D	18	4.9	3.10	**2.19**	96360	**2.24**	98560	**.97**	12930	11640	2520
3	18D	16	5.6	3.11	**2.81**	123640	**2.86**	125840	**1.31**	17470	15720	3640
3	16D	18	5.4	3.11	**2.35**	103400	**2.41**	106040	**.99**	13200	11880	2520
3	16D	16	6.1	3.12	**3.04**	133760	**3.09**	135960	**1.39**	18530	16680	3640
3	14D	14	7.6	3.16	**4.07**	179080	**4.19**	184360	**2.01**	26800	24120	5160
4½	18D	18	5.4	4.60	**5.26**	231440	**5.37**	236280	**1.62**	21600	19440	2120
4½	16D	18	5.9	4.61	**5.64**	248160	**5.76**	253440	**1.65**	22000	19800	2120
4½	16D	16	6.8	4.62	**7.20**	316800	**7.30**	321200	**2.29**	30530	27480	3240
4½	14D	14	8.4	4.66	**9.58**	421520	**9.84**	432960	**3.27**	43600	39240	4760
6	16D	18	6.4	6.11	**10.61**	466840	**10.81**	475640	**2.41**	32130	28920	1720
6	16D	16	7.3	6.12	**13.44**	591360	**13.62**	599280	**3.30**	44000	39600	2840
6	14D	14	9.1	6.16	**17.78**	782320	**18.24**	802560	**4.67**	62260	56040	4360
7½	16D	18	6.9	7.61	**17.46**	768240	**17.77**	781880	**3.27**	43600	39240	1320
7½	16D	16	8.0	7.62	**21.95**	965800	**22.23**	978120	**4.42**	58930	53040	2440
7½	16D	14	9.3	7.64	**26.85**	1181400	**27.47**	1208700	**6.06**	80800	72720	3960
7½	14D	14	10.0	7.66	**28.93**	1272920	**29.64**	1304160	**6.20**	82660	74400	3960
7½	14D	13	11.1	7.67	**34.01**	1496440	**34.21**	1505240	**7.69**	102530	92280	5700
7½	13D	13	11.6	7.68	**36.23**	1594120	**36.45**	1603800	**7.84**	104530	94080	5700

minimum required section modulus

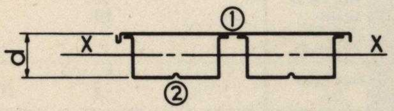
SPANS	S VALUES	total loads in pounds per square foot																			INCREMENT PER LB.
		20	30	35	40	45	50	55	60	70	80	90	100	120	140	160	180	200	220	240	
8'-0"	20,000	.10	.14	.17	.19	.22	.24	.26	.29	.34	.38	.43	.48	.58	.67	.77	.86	.96	1.06	1.15	.0048
	18,000	.11	.16	.18	.21	.24	.26	.29	.32	.37	.42	.48	.53	.64	.74	.85	.95	1.06	1.17	1.27	.0053
9'-0"	20,000	.12	.18	.21	.24	.27	.30	.34	.37	.43	.49	.55	.61	.73	.85	.98	1.10	1.22	1.34	1.46	.0061
	18,000	.13	.20	.23	.27	.30	.34	.37	.40	.47	.54	.60	.67	.80	.94	1.07	1.21	1.34	1.47	1.61	.0067
10'-0"	20,000	.15	.22	.26	.30	.34	.38	.41	.45	.53	.60	.68	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80	.0075
	18,000	.17	.25	.29	.33	.37	.42	.46	.50	.58	.66	.75	.83	1.00	1.16	1.33	1.49	1.66	1.83	2.00	.0083
11'-0"	20,000	.18	.27	.32	.36	.41	.46	.50	.55	.64	.73	.82	.91	1.09	1.27	1.46	1.64	1.82	2.00	2.18	.0091
	18,000	.20	.30	.35	.40	.45	.50	.56	.60	.71	.81	.91	1.01	1.21	1.41	1.61	1.81	2.02	2.22	2.42	.0101
12'-0"	20,000	.22	.32	.38	.43	.49	.54	.59	.65	.76	.86	.97	1.08	1.30	1.51	1.73	1.94	2.16	2.38	2.59	.0108
	18,000	.24	.36	.42	.48	.54	.60	.66	.72	.84	.96	1.08	1.20	1.44	1.68	1.92	2.16	2.40	2.64	2.88	.0120
13'-0"	20,000	.25	.38	.44	.51	.57	.64	.70	.76	.89	1.02	1.14	1.27	1.52	1.78	2.03	2.29	2.54	2.79	3.05	.0127
	18,000	.28	.42	.49	.56	.63	.70	.78	.84	.99	1.13	1.27	1.41	1.69	1.97	2.25	2.53	2.82	3.10	3.38	.0141
14'-0"	20,000	.29	.44	.51	.59	.66	.74	.81	.88	1.03	1.18	1.32	1.47	1.76	2.06	2.35	2.65	2.94	3.23	3.53	.0147
	18,000	.33	.49	.57	.65	.73	.82	.90	.93	1.14	1.30	1.47	1.63	1.96	2.29	2.61	2.94	3.27	3.59	3.92	.0163
15'-0"	20,000	.34	.51	.59	.68	.76	.84	.93	1.01	1.18	1.35	1.52	1.69	2.03	2.37	2.70	3.04	3.38	3.72	4.06	.0169
	18,000	.37	.56	.65	.75	.84	.94	1.03	1.12	1.31	1.50	1.69	1.87	2.24	2.63	3.00	3.37	3.75	4.12	4.50	.0187
16'-0"	20,000	.38	.58	.67	.77	.86	.96	1.06	1.15	1.34	1.54	1.73	1.92	2.30	2.69	3.07	3.46	3.84	4.22	4.61	.0192
	18,000	.43	.64	.74	.85	.96	1.07	1.17	1.28	1.49	1.71	1.92	2.13	2.56	2.99	3.41	3.84	4.27	4.69	5.12	.0213
17'-0"	20,000	.43	.65	.76	.87	.98	1.08	1.19	1.30	1.52	1.74	1.95	2.17	2.60	3.04	3.47	3.91	4.34	4.77	5.21	.0217
	18,000	.48	.72	.84	.96	1.08	1.20	1.32	1.44	1.69	1.93	2.17	2.41	2.89	3.37	3.85	4.33	4.82	5,30	5.78	.0241
18'-0"	20,000	.49	.73	.85	.97	1.09	1.22	1.34	1.46	1.70	1.94	2.19	2.43	2.92	3.40	3.89	4.37	4.86	5.35	5.83	.0243
	18,000	.54	.81	.94	1.08	1.22	1.35	1.48	1.62	1.89	2.16	2.43	2.70	3.24	3.78	4.32	4.86	5.40	5.94	6.48	.0270
19'-0"	20,000	.54	.81	.95	1.08	1.22	1.36	1.49	1.63	1.90	2.17	2.44	2.71	3.25	3.79	4.34	4.88	5.42	5.96	6.50	.0271
	18,000	.60	.90	1.05	1.20	1.35	1.50	1.66	1.80	2.11	2.41	2.71	3.01	3.61	4.21	4.81	5.41	6.02	6.62	7.22	.0301
20'-0"	20,000	.60	.90	1.05	1.20	1.35	1.50	1.65	1.80	2.10	2.40	2.70	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20	.0300
	18,000	.67	1.00	1.16	1.33	1.50	1.67	1.83	2.00	2.33	2.67	3.00	3.33	4.00	4.67	5.33	6.00	6.67	7.33	8.00	.0333
21'-0"	20,000	.66	.99	1.16	1.32	1.49	1.66	1.82	1.97	2.32	2.65	2.98	3.31	3.97	4.63	5.30	5.96	6.62	7.28	7.94	.0331
	18,000	.73	1.10	1.28	1.47	1.65	1.84	2.02	2.20	2.57	2.94	3.31	3.67	4.40	5.14	5.88	6.61	7.35	8.08	8.82	.0367
22'-0"	20,000	.73	1.09	1.27	1.45	1.63	1.82	2.00	2.18	2.54	2.90	3.27	3.63	4.36	5.08	5.81	6.53	7.26	7.97	8.71	.0363
	18,000	.81	1.21	1.41	1.61	1.81	2.02	2.22	2.42	2.82	3.22	3.63	4.03	4.84	5.65	6.45	7.26	8.07	8.87	9.68	.0403
23'-0"	20,000	.79	1.19	1.39	1.59	1.79	1.98	2.18	2.38	2.78	3.18	3.57	3.97	4.76	5.56	6.35	7.15	7.94	8.73	9.53	.0397
	18,000	.88	1.32	1.54	1.76	1.98	2.20	2.42	2.64	3.09	3.53	3.97	4.41	5.29	6.17	7.05	7.93	8.82	9.70	10.58	.0441
24'-0"	20,000	.86	1.30	1.51	1.73	1.94	2.16	2.38	2.59	3.02	3.46	3.89	4.32	5.18	6.05	6.91	7.78	8.64	9.50	10.37	.0432
	18,000	.96	1.44	1.68	1.92	2.16	2.40	2.64	2.88	3.36	3.84	4.32	4.80	5.76	6.72	7.68	8.64	9.60	10.56	11.52	.0480
25'-0"	20,000	.94	1.41	1.64	1.88	2.11	2.35	2.58	2.81	3.28	3.75	4.22	4.69	5.63	6.57	7.50	8.44	9.38	10.32	11.26	.0469
	18,000	1.04	1.56	1.82	2.08	2.34	2.60	2.86	3.12	3.65	4.17	4.69	5.21	6.25	7.29	8.33	9.37	10.42	11.46	12.50	.0521
26'-0"	20,000	1.01	1.52	1.77	2.03	2.28	2.54	2.79	3.04	3.55	4.06	4.56	5.07	6.08	7.10	8.11	9.13	10.14	11.15	12.17	.0507
	18,000	1.13	1.69	1.97	2.25	2.53	2.82	3.10	3.38	3.94	4.51	5.07	5.63	6.76	7.89	9.01	10.14	11.27	12.39	13.52	.0563
27'-0"	20,000	1.09	1.64	1.91	2.19	2.46	2.74	3.01	3.29	3.83	4.38	4.92	5.47	6.56	7.66	8.75	9.85	10.94	12.03	13.13	.0547
	18,000	1.21	1.82	2.12	2.43	2.73	3.04	3.34	3.64	4.25	4.86	5.47	6.07	7.29	8.50	9.72	10.93	12.15	13.36	14.58	.0607
28'-0"	20,000	1.18	1.76	2.06	2.35	2.65	2.94	3.23	3.53	4.12	4.70	5.29	5.88	7.06	8.23	9.41	10.58	11.76	12.94	14.11	.0588
	18,000	1.31	1.96	2.28	2.61	2.94	3.27	3.59	3.92	4.57	5.23	5.88	6.53	7.84	9.14	10.45	11.76	13.07	14.37	15.68	.0653
29'-0"	20,000	1.26	1.89	2.21	2.52	2.84	3.16	3.47	3.79	4.42	5.05	5.68	6.31	7.57	8.83	10.10	11.36	12.62	13.88	15.14	.0631
	18,000	1.40	2.10	2.45	2.80	3.15	3.50	3.86	4.20	4.91	5.61	6.31	7.01	8.41	9.81	11.21	12.61	14.02	15.42	16.82	.0701
30'-0"	20,000	1.35	2.02	2.36	2.70	3.03	3.38	3.71	4.05	4.72	5.40	6.08	6.75	8.10	9.45	10.80	12.15	13.50	14.85	16.20	.0675
	18,000	1.50	2.25	2.62	3.00	3.38	3.75	4.12	4.50	5.25	6.00	6.75	7.50	9.00	10.50	12.00	13.50	15.00	16.50	18.00	.0750
31'-0"	20,000	1.44	2.16	2.52	2.88	3.24	3.60	3.96	4.33	5.05	5.77	6.49	7.21	8.65	10.09	11.54	12.98	14.42	15.86	17.30	.0721
	18,000	1.60	2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.60	6.40	7.20	8.00	9.60	11.20	12.80	14.40	16.00	17.60	19.20	.0800
32'-0"	20,000	1.54	2.30	2.69	3.07	3.46	3.84	4.22	4.61	5.38	6.14	6.91	7.68	9.22	10.75	12.29	13.82	15.36	16.90	18.43	.0768
	18,000	1.71	2.56	2.98	3.41	3.84	4.26	4.69	5.12	5.97	6.82	7.68	8.53	10.24	11.94	13.65	15.35	17.06	18.77	20.47	.0853
33'-0"	20,000	1.63	2.45	2.86	3.27	3.68	4.08	4.49	4.90	5.72	6.54	7.35	8.17	9.80	11.44	13.07	14.71	16.34	17.97	19.61	.0817
	18,000	1.81	2.72	3.17	3.63	4.08	4.54	4.99	5.44	6.35	7.26	8.16	9.07	10.88	12.70	14.51	16.33	18.14	19.95	21.77	.0907
34'-0"	20,000	1.73	2.60	3.03	3.47	3.90	4.34	4.77	5.20	6.07	6.94	7.80	8.67	10.40	12.14	13.87	15.61	17.34	19.07	20.81	.0867
	18,000	1.93	2.89	3.37	3.85	4.33	4.82	5.30	5.78	6.74	7.70	8.67	9.63	11.56	13.48	15.41	17.33	19.26	21.19	23.11	.0963
35'-0"	20,000	1.84	2.76	3.22	3.68	4.14	4.60	5.05	5.51	6.43	7.35	8.27	9.19	11.03	12.87	14.70	16.54	18.38	20.22	22.06	.0919
	18,000	2.04	3.06	3.57	4.08	4.59	5.10	5.61	6.12	7.14	8.16	9.18	10.20	12.24	14.28	16.32	18.36	20.40	22.44	24.48	.1020

- **Constants for selection of required section modulus for odd spans not covered in table on this page.**

Span (L) in feet **(W=Total Load) in pounds per sq. ft.**

$S = .000075WL^2$ (20,000 psi design stress) **$S = .0000833WL^2$ (18,000 psi design stress)**

- **Check web strength per page 9.**



panel section properties (per 12" width)

24" wide double hat "D" panel—flat plate up

SECTION NUMBER				AXIS X—X—							
				f=20,000		f=18,000			f=20,000	f=18,000	
NOM. DEPTH	GAGE		WT. PER SQ. FT.	ACTUAL DEPTH	"I"	COEF. OF DEFLEC. L/360	"I"	COEF. OF DEFLEC. L/360	"S"	COEFFICIENT OF STRENGTH		WEB STRENGTH VALUES PER 3" BEARING
	1	2	LBS.	IN.	IN.⁴		IN.⁴		IN.³			
1½	18U	18	4.4	1.60	.48	21120	.50	22000	.54	7200	6480	2920
1½	18U	16	4.9	1.61	.56	24640	.58	25520	.59	7870	7080	4040
1½	16U	16	5.5	1.62	.64	28160	.66	29040	.72	9600	8640	4040
1½	14U	14	6.9	1.66	.85	37400	.88	38720	.97	12930	11640	5560
3	18U	18	4.9	3.10	2.07	91080	2.08	91520	1.15	15330	13800	2520
3	18U	16	5.6	3.11	2.39	105160	2.41	106040	1.27	16930	15240	3640
3	16U	18	5.4	3.11	2.34	102960	2.37	104280	1.41	18800	16920	2520
3	16U	16	6.1	3.12	2.71	119240	2.73	120120	1.53	20400	18360	3640
3	14U	14	7.6	3.16	3.56	156640	3.59	157960	2.05	27330	24600	5160
4½	18U	18	5.4	4.60	4.94	217360	4.97	218680	1.87	24930	22440	2120
4½	18U	16	6.2	4.61	5.74	252560	5.79	254760	2.10	28000	25200	3240
4½	16U	16	6.8	4.62	6.43	282920	6.50	286000	2.38	31730	28560	3240
4½	14U	14	8.4	4.66	8.40	369600	8.48	373120	3.31	44130	39720	4760
6	16U	16	7.3	6.12	12.01	528440	12.13	533720	3.59	47860	43080	2840
6	14U	14	9.1	6.16	15.64	688160	15.78	694320	4.69	62530	56280	4360
7½	16U	16	8.0	7.62	19.67	865480	19.84	872960	4.69	62530	56280	2440
7½	14U	14	10.0	7.66	25.52	1122880	25.76	1133440	6.19	82530	74280	3960
7½	14U	13	11.1	7.67	28.94	1273360	29.18	1283920	6.80	90660	81600	5700
7½	13U	13	11.6	7.68	31.64	1392160	31.95	1405800	7.76	103460	93120	5700

engineering data (continued)

lateral diaphragm design - (seismic and wind)

To incorporate "lateral diaphragm" or "seismic design" into the basic design of a building, the tables below and the details on the following page summarize results of extensive tests that have been conducted on this phase of panel engineering. Fenestra has also published detailed sample problems which may be obtained by requesting BP-40 from your local Fenestra representative. In addition to being capable of transferring lateral forces applied to a building frame by earthquakes, Fenestra panels can be utilized to resist wind loads, thereby affecting the structural steel design by reducing the wind bracing necessary. This can be accomplished by the proper selection of a "panel system" and a correct welding pattern.

To utilize "lateral diaphragm" design, a floor panel is selected on the basis of load and span conditions with a check for web strength. In the case of "seismic" design (for earthquake loading) the building must be analyzed for the resultant seismic shear, which is determined by total vertical load, the seismic factor for the particular zone in question (check local building code) and the length-to-width ratio of the building unbroken by shear walls. When the resultant seismic shear is determined by usual design analysis, a panel placement system is selected from the table that affords equal or greater "design shear" values. Details on page 13 give the necessary welding details for the panel to the structural steel and for panels to each other, that will develop the necessary shear resisting values.

Designing for wind loading is similar, with the proper wind loads being figured to act from mid-height of the floor below to the mid-height of the floor above as a direct horizontally applied load without the use of factors or coefficients. In many instances, wind loads are considered to increase as the height of the "free" building increases. Check local codes for proper procedure and values.

In designing for both "Seismic Shear" and wind load, the **greater load only** is considered in the final determination of the structural requirements of the building.

All values in the tables have been developed through extensive tests† conducted for the specific purpose of determining the values of Fenestra Panels in their action against laterally applied forces. Values shown are adaptable to Fenestra Panels only and cannot be used for other panel types or cross sections.

†Thirty-eight full scale tests conducted over a four-year period at Cornell University by an independent consulting structural engineer to supplement data obtained earlier through nine tests conducted by California Institute of Technology personnel and a west coast consulting engineer. Further technical data and a complete sample design problem are available from the district sales offices listed on the back cover of this catalog or from your local Fenestra representative. For additional information and design examples, refer to "lateral diaphragm design", BP-40, available upon request.

design and welding recommendations

System No.	System Type	Panel	Design Shear (# /LF)														Connections*		
			Panel Span (Ft.)														End (Details 1-2)	Edge (Details 3-4)	Joint (Details 5-6)
			8	10	12	14	16	18	20	22	24	26	28	30	32	34	P. 15	P. 15	P. 15
I	Flat Plate Down Std. (Riv-Clinched Side Laps)	1½ 18D-18	670	550													1" Puddle Welds 3 Per Panel	1" Puddle Welds 36" on Center	Riv-Clinches 24" on Center (Slightly Higher Design Shears May be obtained By Using an 18" Riv-Clinch Spacing. Data Available Upon Request)
		1½ 16D-18	810	660															
		3 18D-18	670	550	470	410	370												
		3 18D-16	780	640	540	470	410												
		3 16D-18	810	670	570	500	450												
		4½ 18D-18			470	420	380	340	310	290									
		4½ 16D-18			570	500	450	410	380	360									
		6 16D-18						420	380	360	340	320	310	290					
		7½ 16D-18							390	360	340	320	310	300	290	280			
		Flat Plate Gage	Design Shear (# /LF)																
Ia	Flat Plate Down Std. Welded	16 18	520 370														¾" Fillet Welds 3 Per Panel	¾" Fillet Welds 36" on Center	1" Seam Welds 36" on Center
II	Flat Plate Down High Str. Welded	16 18	910 740														1" Puddle Welds 3 Per Panel	1" Puddle Welds 24" on Center	1½" Seam Welds 18" on Center
III (1½ or 3D only)	Flat Plate Up	16 18	670 420														¾" Fillet Welds 3 Per Panel	¾" Fillet Welds 36" on Center	¾" Seam Welds 36" on Center
IV	Flat Plate Up	16 18	1220 770														¾" Fillet Welds 4 Per Panel— 16 Ga. Continuous Angle Welded To Panels & Beams with ¾" Fillet Welds @ 24" O.C.	1" Fillet Welds 24" on Center	1" Fillet Welds 24" on Center
IVa		16 18	810 510																1" Fillet Welds 36" on Center
		Flat Plate Gage	Concrete f'c							Design Shear (# /LF)									
V	Flat Plate Down With 2½" Concrete Fill	16 18	2000 Psi Min. 2000 Psi Min.							1580 1060 1350 676							1" Puddle Welds 3 Per Panel	1" Puddle 24" O.C. 1" Puddle 36" O.C. 1" Puddle 18" O.C. 1" Puddle 36" O.C.	Riv-Clinches 24" on Center
		Other design Shear values for this system can be obtained by varying the edge weld spacing, maximum spacing 36", and the strength of the concrete. Data available upon request.																	
VI	Flat Plate Up With 2½" Concrete Fill	Use details and working shears for Flat Plate Up Systems III, IV & IVa, as applicable.																	

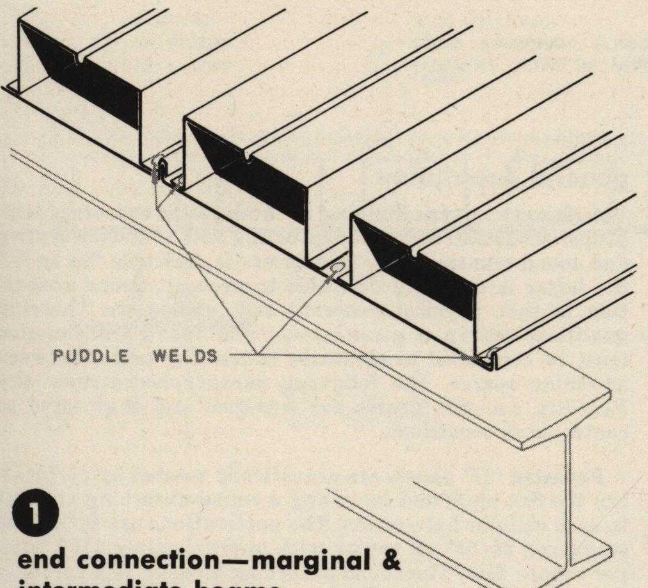
Notes:

1. All recommended design shear values in the above table are based on a safety factor of 3. This is the generally accepted safety factor for use in designing light gage steel diaphgrams to resist seismic action on wind loads.
2. For System No. I, the design shear values for the heaviest gage panel shown in each depth also apply to heavier gage panels of comparable depth. In all other systems, the design shear values for the heaviest gage flat plate shown also apply to heavier gage flat plate panels.
3. Design shear values shown for all flat plate down systems (I, Ia, II and V) are applicable to either plain or acoustic D panels.
4. Information in the above table supersedes that shown in previous editions of this catalog.

*It is recommended that welding shall be done only by thoroughly qualified welders who shall make practice welds prior to actual job welding on samples of the decking to be used, to check the adequacy of the welding rod, amperage and burn-off rate specified for the various welds required.

lateral diaphragm details

only material in **black** furnished by Fenestra



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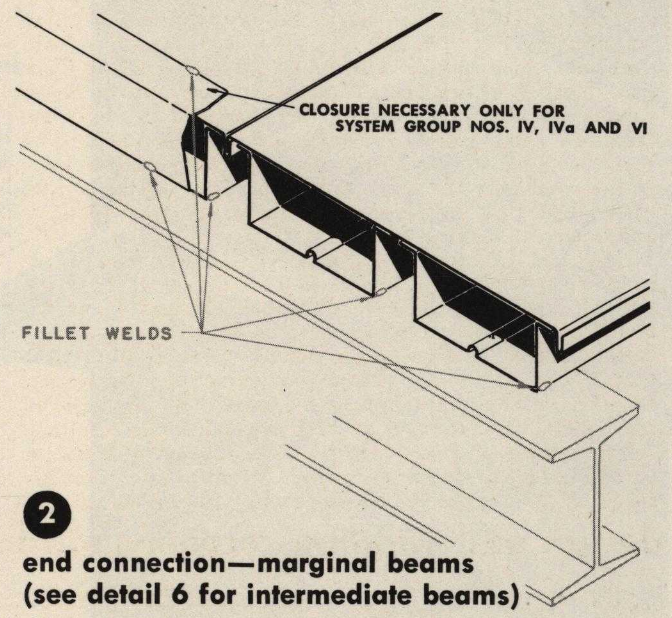
end connection—marginal & intermediate beams



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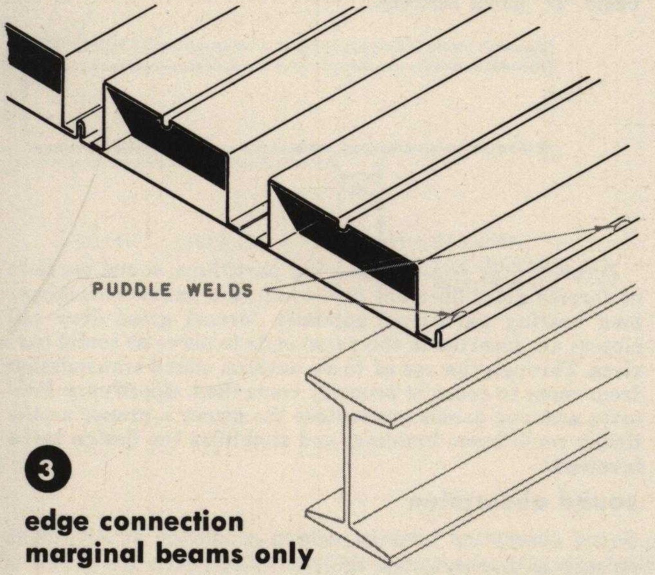
end connection—marginal beams (see detail 6 for intermediate beams)



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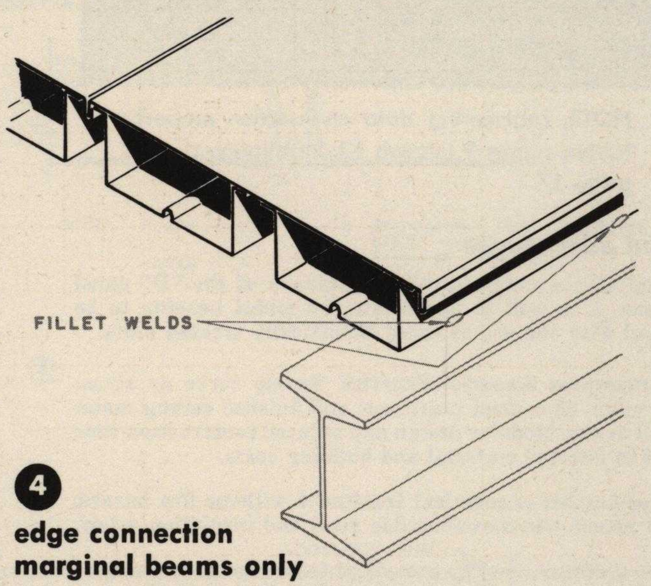
edge connection marginal beams only



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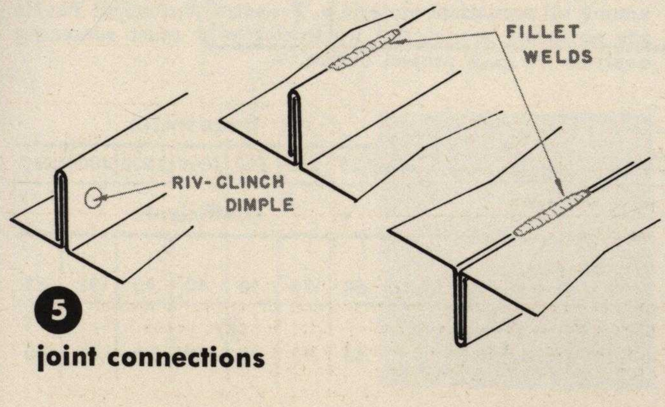
edge connection marginal beams only



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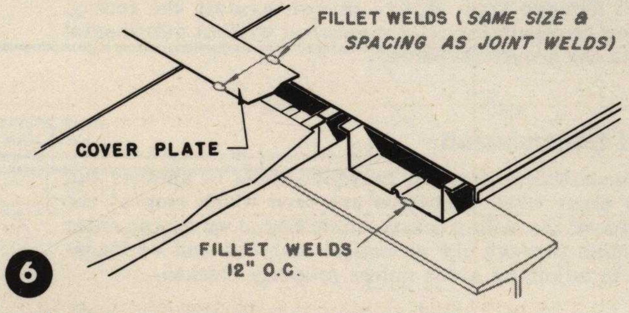
joint connections



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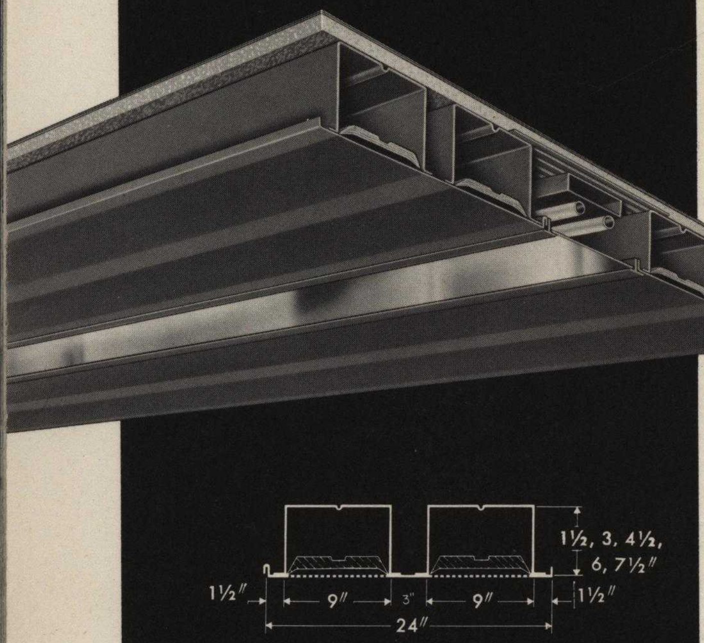
end connection—butt joint condition intermediate beams only

Acoustic D Panels



Acoustic "D" panel

general description

For almost any type building the architect is concerned with proper acoustical correction involving both sound absorption and sound transmission. The former is desirable "to have," the latter is normally desirable to prevent. Sound absorption is that physical property that effects the "hearing qualities" within a given space, and sound transmission must be controlled to eliminate distracting noises between adjoining spaces. The following paragraph describes why Fenestra acoustic panels are designed and engineered to control both conditions.

Fenestra "D" panels are acoustically treated by perforating the flat plate and installing a sound-absorbing element in each cellular hat-section. The perforations are ⅛" round, staggered 25/64" on center with approximately 1150 holes per square foot. The sound absorbing element is a specially formed arched pad, 1" thick, molded from extra fine glass fibers. This combination provides a highly efficient acoustical unit, still retaining the structural advantages of the basic "D" panel sections.

NOTE: Engineering data and section property tables, pages 9 through 13. Installation details, page 17.

added advantages

Beyond all the many proven advantages of the "D" panel systems, it is well to appreciate the added benefits to be realized with the use of these acoustically treated units.

Multipurpose Economy—Fenestra Panels serve as structural units, acoustical treatment and finished ceiling material all in one. Modular design and reduced construction time result in lowered material and building costs.

Incombustible—Acoustical treatment without fire hazard, as all panels use incombustible steel and insulation solely.

Low Maintenance—The acoustical treatment is an integral part of the structural section and cannot loosen or become detached. The heavy gages used for the structural function prevent damage from objects thrown against the ceiling. Washing or repainting is accomplished without detrimental effect to the acoustical value.

sound transmission

The transmission of sound from one room to another can readily occur when partitions are used which stop at the underside of the ceiling construction. Sound waves can enter the plenum through the acoustical material and be transmitted to adjoining areas unless properly blocked.

In a suspended acoustical ceiling system, it is generally costly and difficult to effect a sound barrier in the plenum above partitions. However, using a Fenestra panel system, this is readily handled within the confines of the cells.

Directly over non-load-bearing partitions, sound barriers of formed glass fiber are inserted in the panel cells. Above load bearing partitions, specially formed glass fiber cell closers are inserted in the panel ends to serve as sound barriers. Through the use of these devices, sound transmission from room to room is properly controlled. Specifying Fenestra acoustic panels guarantees the owner a proper acoustically conditioned building, and simplifies the design tasks involved.

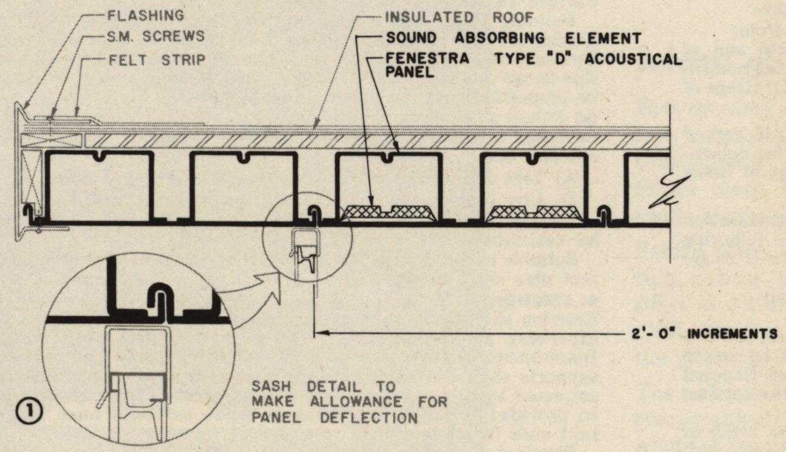
sound absorption

Sound absorption tests have been conducted at Riverbank Acoustical Laboratories, the results of which are shown in the table below. Examination and comparison of these tests results will show Fenestra Acoustical Panels rate high among all acoustical materials. Fenestra Acoustical Panels are obviously a material worthy of your most searching analysis for each project design.

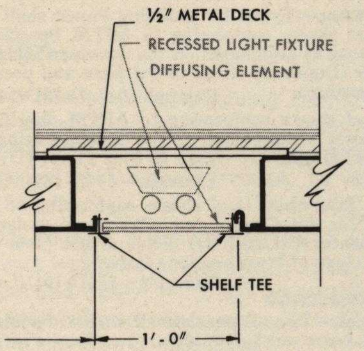
panel type	frequencies						
	125	250	500	1000	2000	4000	NRC
	coefficients						
alternate type D (24") flat plate down test no. A56-158	.58	.72	.53	.40	.45	.31	.55
all type D (24") flat plate down test no. A59-38	.85	.92	.84	.66	.78	.51	.80

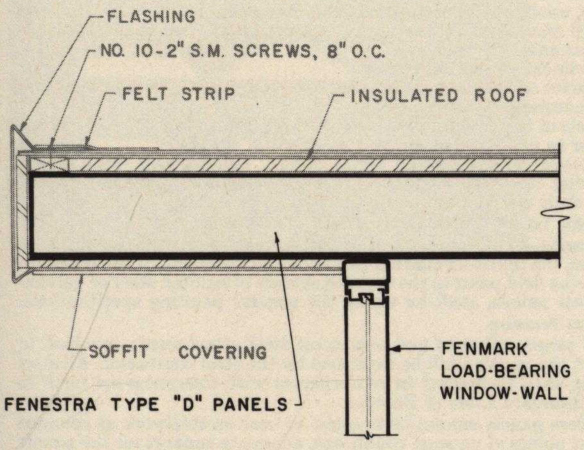
details scale—¾″ = 1′-0″

only materials in **black** furnished by Fenestra


FLASHING
S.M. SCREWS
FELT STRIP
INSULATED ROOF
SOUND ABSORBING ELEMENT
FENESTRA TYPE "D" ACOUSTICAL PANEL
2'-0" INCREMENTS
SASH DETAIL TO MAKE ALLOWANCE FOR PANEL DEFLECTION

①





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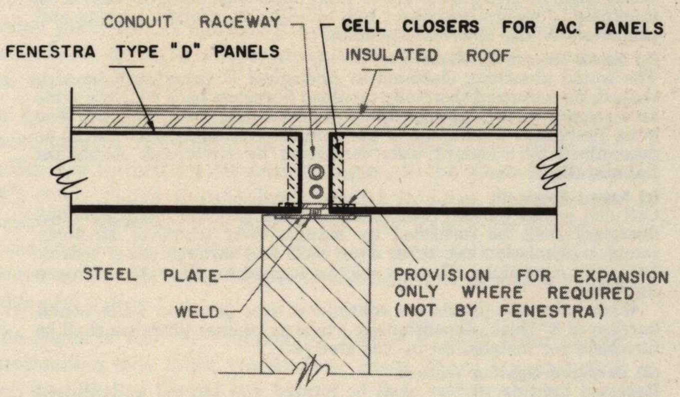
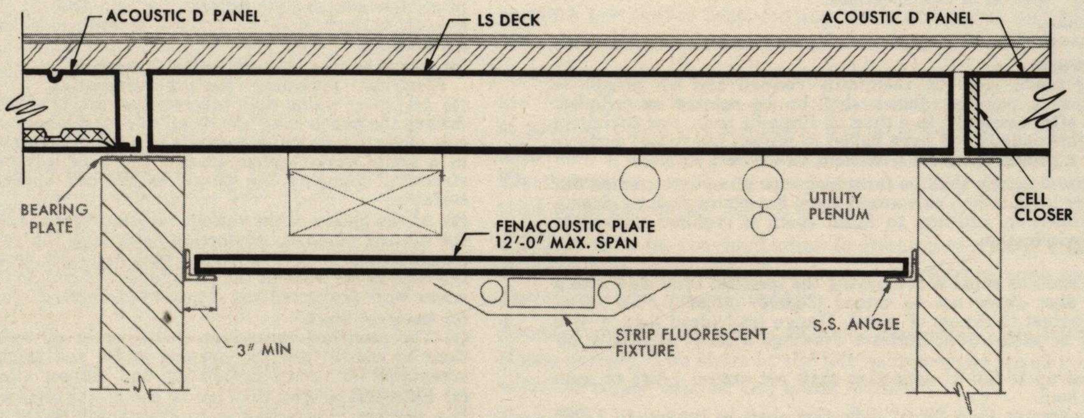

CONDUIT RACEWAY
CELL CLOSERS FOR AC. PANELS
FENESTRA TYPE "D" PANELS
INSULATED ROOF
STEEL PLATE
WELD
PROVISION FOR EXPANSION ONLY WHERE REQUIRED (NOT BY FENESTRA)

③



④

specifications

"D" PANEL ROOF SYSTEM

1. GENERAL—All roof areas noted on plans shall be covered with Fenestra Building Panels as manufactured by Fenestra Inc.

2. MATERIAL—Type "D" Building Panels shall be formed from:

(a) Steel sheets conforming to ASTM Specifications A-245 and of USS gages as designated on the drawings using the following nomenclature: (Depth D) (Gage of flat plate and position U or D) (Gage of beam section). Example—4½D-16D-16

(b) Steel sheets conforming to ASTM Specifications A-245 and of USS gages as designated on the drawings using the following nomenclatures: (Depth D) (Gage of Flat Plate) (D) (AC) (Gage of Beam Section). Example—4½D-16D(AC)16

(c) Or galvanized steel sheets conforming to Federal Specification QQ-S-775a for *Class e* galvanizing and designated in the following nomenclature: (Depth D) (Gage of flat plate and position U or D) Galv. (Gage of beam section) Galv.
Example—4½D-16D(Galv. 16) (Galv.)

3. CONSTRUCTION

(a) Panels—Type D panels shall consist of a jointed flat plate and two formed beam sections integrated to form a structural unit by means of four rows of sound resistance welds spaced 4½″ on center. Exposed flat plate down shall not be less than 16 gage unless otherwise detailed with stiffening ribs 8″ on center and indicated as 18 gage.

The flat plate shall have male-female joints with sharp 90° bends to assure a tight, neat joint. The flat plate for Acoustical D panels shall be perforated with ⅛″ holes staggered 25/64″ on center in two continuous paths 9″ wide.

The beam sections shall be 9″ wide so that in the assembled panel there is a 3″ void between beam sections to allow for placement of standard 3″ electrical outlet or junction boxes. The top flange of the beam sections shall be virtually flat and level to provide a bond and support area for roof insulation of 75% of the coverage area. All 90° bends shall be sharp with inside radii nominally equal to the metal thickness to assure maximum web strength at support bearing and properties of the assembled section.

(b) Sound Absorbing Element

The sound absorbing elements in Acoustical D panel shall be arch shaped, pressure and thermally moulded fiberglass pads which provide an air space of ½″ between the perforated steel plate and pad. The noise Reduction Coefficient of the complete assembly shall be .80 as determined by standard tests conducted by Riverbank Acoustical Laboratories.

(c) Sound Barriers

Cell end sound barrier closures of pressure and thermally moulded fiberglass shall be furnished by manufacturer wherever air-borne sound transmission can occur over walls and through panel cells at butt joint conditions. Closures shall be formed to cell profile to insure tight fit.

Where acoustic panels are continuous over partition walls, sound barriers of 3″ thick, dimensionally oversize, laminar fiberglass shall be furnished for installation by the erector.

(d) Recessed Lighting Troffers

Recessed lighting troffers shall be located and erected as indicated on the contract drawings.

Recessed lighting troffer areas shall be covered with ½″ depth galvanized corrugated decking, spanning across the opening and bearing on the top surface of the D Panels adjacent to the opening.

D Panels adjacent to recessed lighting troffer opening shall be increased to gages indicated on drawings to support additional load introduced by the reaction of the ½″ decking.

Shelf tees required to support diffusers for troffer lighting shall be furnished by the panel manufacturer and installed as specified under "Carpentry" section of Specifications.

(e) Sump Plates

Sump Plates shall be of 16 gage steel, lapping deck a minimum of 6″.

4. SHOP FINISH

(a) Ceiling plates shall be chemically cleaned and hot phosphate treated prior to painting. Panels shall be dip-painted by complete immersion after assembly, in a tung oil Phenolic resin, rust inhibitive zinc chromate enamel and oven baked to protect unexposed surfaces and act as a primer for finish treatment on exposed surfaces.

(b) Galvanized panels shall be furnished with phosphate treated flat plates. After installation, galvanized panel flat plates shall be given a coat of primer, in addition to finish coats as required, under the Painting Specification.

5. DESIGN

(a) Panels shall be capable of carrying the specified total load with a maximum fiber stress not to exceed (20,000) (18,000) PSI (insert stress) on actual thickness of metal. Design load (dead load + live load) shall be taken from contract drawings without allowance for impact.

For spans up to 20′-0″ deflection shall not exceed 1/240 of span under live load.

On spans greater than 20′-0″ deflection shall be limited to 1/360 under live load, and gages of panels shall be not less than those indicated on drawings.

Panel design is to be in accordance with the American Iron and Steel Institute's "Specification for the design of Light Gage Cold-Formed Steel Structural Members, 1962."

Building Panel Roofs shall be capable of providing continuous bracing for the compression flange of all horizontal supporting members such as beams, girders, arches and trusses, so that the compression flange can carry the full design stress. Welding of the panels shall be proportioned to the bracing force required.

(b) Panels adjacent to skylite openings up to 4′-0″ in width shall be increased to gages indicated on drawings to support applied header reaction due to loads resulting from:

A) Live and dead load from full area of interrupted panels.

B) Live load on and dead load of skylites and curbs.

Headers required to support short panels at ends of openings shall be steel tubes.

Suitable reinforcement for other roof openings as indicated on the roof plan shall be provided.

6. ERECTION

Erection shall be by manufacturer or qualified erector with proven experience and competence, under a single responsibility contract. Inaccuracies in alignment or level of bearing plates and structural supports shall be brought to the attention of proper parties and corrected by others before placement of panels. Proper gearing shall be provided at supporting members. Allow sufficient room between butt ends for placement of conduit.

Panels shall be attached to steel supports with three ½″ fillet welds per panel end. All welds to be touched up on the top side only. RLT Panels shall be fastened to each supporting beam with two ¾″ welds per panel. Longitudinal welding in accordance with shop drawings. All welding shall be electric arc welding performed by competent welders. All welds upon cooling shall be given a touch-up coat of paint. Panels used on laminated wood arches shall be directly fastened through flat plate into arches, in accordance with manufacturer's recommendations. Side joints of panels shall be integrated by means of riv-clinches 3 feet on centers.

All holes or openings in roof shall be cut and reinforced as shown on manufacturers' layout drawings.

Panels at ridges shall be folded over ridge at centerline of 24″ panel, in order to avoid use of exposed sheet metal closure.

Wherever exposed sheet metal occurs, puddle weld from above. Fastening by sheet metal screws or welding at raw edge of sheet metal shall not be permitted.

7. WORK TO BE INCLUDED IN OTHER CONTRACTS

(a) Painting—The touch-up of scuffs and abrasions due to transit or erection, the touch-up charred points on the underside of the welds, as well as the field paint to the exposed surface of painted steel or galvanized steel panels, shall be under the general painting specifications.

(b) Steel Framing

(1) All structural steel and structural steel attachments required to support the panels shall be furnished by the steel contractor. All steel framing shall be erected in conformance with tolerances set forth in AISC Standard Code of Practice.

(2) Where panels cannot be brought to bear on steelwork at columns or other points of unusual conditions, adequate support for the panels shall be furnished by designated contractor.

(c) Built-Up Roofing

(1) Insulation—(24″ Type "D" Panel flat plate down)—Insulation shall be rigid type roof insulation__________thick (minimum thickness and application based on roofer's standard recommendations) to span the 3″ opening. A minimum of ½″ of rigid or semi-rigid board insulation can be used on "D" panels with the flat side up and shall be applied according to the manufacturer's recommendations.

(2) Built-Up Roofing—Twenty year bonded built-up roofing of (1) pitch, felt and slag (2) asphalt, felt and slag (3) asphalt or asbestos smooth surface shall be applied according to the manufacturer's specification.

(d) Openings (not covered under 5. Design)

Electrical—plumbing—heating—ventilating.

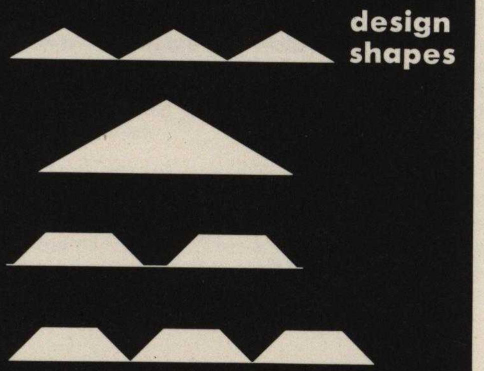
(1) All trades whose work involves the cutting of holes, reinforcing or drilling the panels shall furnish all work and labor necessary and at the cost of that trade whose works is affected. All such work shall be done in a neat, workman-like manner, without adversely affecting the structural value of the panels or finished appearance of exposed surfaces.

(2) At the option of the various sub-contractors whose work involves the cutting of holes, reinforcing or drilling the panels, the building panel contractor shall furnish all work and labor necessary only during the time of his work at the job site, at the cost to the sub-contractor whose work is affected and at prices to be agreed upon by both parties.

(e) Electrical Work

(1) The electrical contractor shall inspect all light troffer installations to assure that the opening width and height dimensions are acceptable for fixture installation and diffuser attachment.

(2) Electrical conduit shall not be laid on the top surface of the panels in a manner to interfere as an obstruction to the placement of roof insulation. Conduit shall be laid below the top surface of the panels, in the flutes and in space allotted between ends of panels.



folded plate design

Eye catching profiles and clean, efficient, column free, truss free, long span structures are all possible with folded plate roof construction. A variety of shapes are feasible from simple folded plate, even a pitched roof without trusses, to more exotic shapes shown to the left.

Folded plate, as the name implies, is simply a series of long, thin, narrow, plate elements which have been joined along the edges into a series of ridges and valleys much like an accordian pleat. Vertical loads are resolved into components carried into the plane of these plates in the form of web shear.

The action of the sloping plates in carrying web shear is directly comparable to that of lateral diaphragms in resisting seismic or wind loadings. Fenestra has pioneered in the development and use of light gage steel panel systems in diaphragm design. Research started with full scale tests as early as 1950 on the West Coast. Since 1955, over 50 additional tests have been conducted at Cornell University. In line with the development of folded plate construction, utilizing light gage steel panels, Fenestra has conducted a full scale, completely instrumented folded plate test at Cornell University. Results of this test are available in detail in a brochure published by Fenestra covering the design procedures.

In developing folded plate action, "D" Panels are cut into short lengths running from ridges to valley. The ridge and valley are formed by structural angles, if the slope is exactly 45°, (bent plates if not) butt welded to form a continuous structural member. The ends of the "D" Panels are welded to these continuous members so that each plate acts as a stiffener (much as a flange on a beam) to the adjacent elements at the ridge and valley.

The edges of the "D" Panels are welded to each other at the interlocking side joint, transferring shear like a homogeneous web of a beam.

The economy of such a system is readily apparent since the structural system is also the roof deck, the finished ceiling, the acoustical treatment all in one thin compact package ready for painting and roofing.

As opposed to concrete folded plate systems, the Fenestra "D" Panel system offers much lighter weight, saving 40 to 50 pounds or more per square foot, cutting down structural and foundation costs and problems.

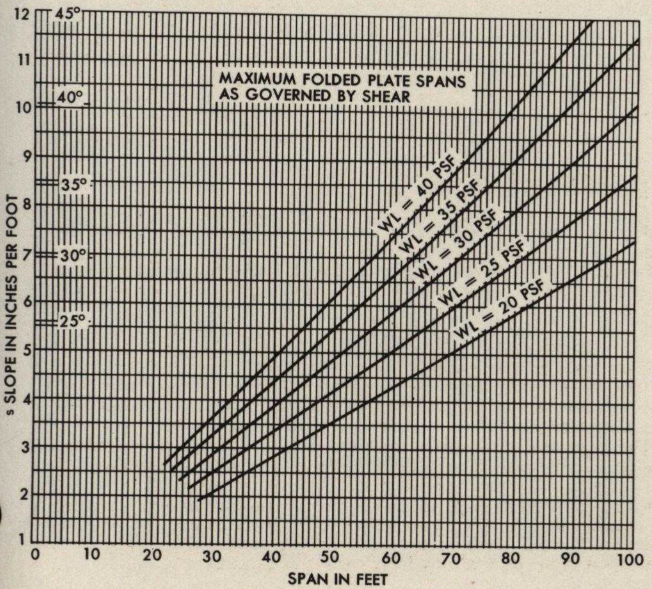
Speed is another feature, since it is not necessary to wait for the "right" weather for construction. Shoring can be removed as soon as welding is complete, not after waiting 28 days. The underside is already acoustically treated, saving finishing time. Electrification can be accomplished swiftly, without several trips to place conduit before erection.

All that must be provided prior to erection is a shear frame or shear wall and a level hard surface to shore from, such as compacted earth or a concrete slab.

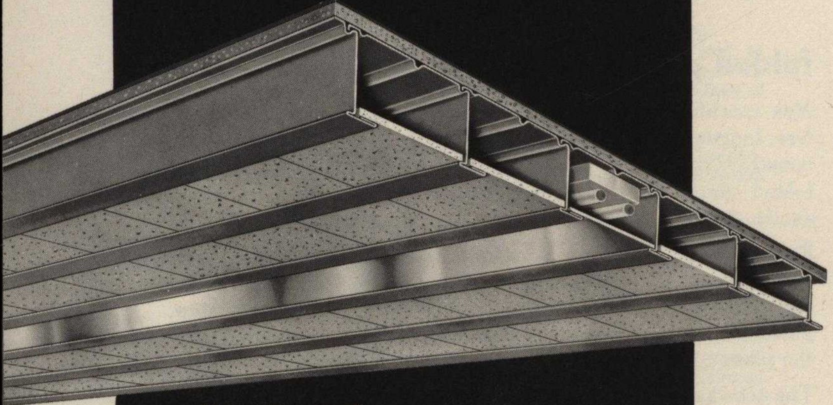
Spans of over 100′-0″ can be achieved depending upon loads and slopes desired. The chart at the left indicates the spans possible with the slopes desired and loads required.

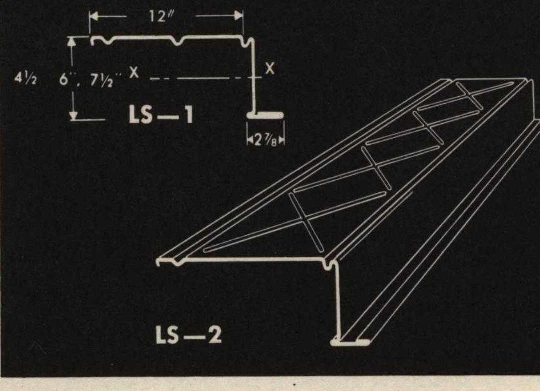
Few other long span structural systems offer as much quality for so little cost.

span vs. slope charts for multiple bay folded plate shear systems



LS deck
for spans up to 32 feet and *Fentura* roof systems
LS (long span) deck—the basic unit





general description

Fenestra's Fentura Roof Deck System, a new concept of long-span construction, provides architectural versatility, unique structural, and acoustical features at minimum cost. The "LS" (long span) deck unit itself is available in 4½", 6" and 7½" depths, in 20, 18, 16 and 14 gages, to permit spans to 32' for certain roof loads. Longer lengths can be obtained for overhangs. Its unique design, efficient use of metal, plus the exclusive Fenestra "stiffened web," achieve an exceptional strength-weight ratio for maximum economy. The product is cold formed in a continuous rolling operation to insure complete uniformity. The architect may select almost any type ceiling treatment. "LS Deck can be left exposed for various applications, canopies, loading docks, or other similar uses. It can be finished at any time with recessed lights, acoustic tile, (shown in details) for ceiling treatment of schools, offices, and other similar structures. "LS" Deck is designed in accordance with American Iron & Steel Institutes specifications for light gage structural members.

material

All steel used in Fenestra "LS" Roof Deck is tight coat galvanized in accordance with Federal Specification QQ-S-775a, *class e*. The galvanized stock is supplied with a mill applied chromate treatment which permits direct application of field paint for interior surfaces, under normal conditions.

lateral diaphragm design

Fenestra LS Deck, with its continuous top sheet, is easily adapted for use as a roof diaphragm for the transmittal of lateral forces due to seismic action or wind. A series of seven full scale tests, conducted at Cornell University by an independent consulting structural engineer, substantiate the performance of LS Deck for this usage. The following table lists lateral diaphragm design shears for the various depth, type and gage sections:

design shears

Depth	Deck Type	Gage	Design Shear (#/LF)*
4½	LS2	20	510
4½	LS2	18	860
4½	LS1	16	890
6	LS2	20	510
6	LS2	18	860
6	LS1	16	650
7½	LS2	18	860
7½	LS2	16	970
7½	LS1	18	575
7½	LS1	16	650
7½	LS1	14	720

*All recommended design shear values in the above table are based on a safety factor of 3 applied to the failure shear values from tests. This is the generally accepted safety factor for use in designing light gage steel diaphragms to resist seismic action or wind. The above design shear values are applicable for all deck spans up to the maximum span for each deck unit under vertical loading.

deck types available

LS Deck is available in two types as illustrated above, LS-1 and LS-2. The types differ in their distribution of metal and the method of top, or compression, flange stiffening to achieve a maximum strength property range with a minimum number of sections. This complete range of sections affords the architect and engineer unusual latitude in solving various design requirements.

connections

The design shear values are based on the following system of connections:

End—1" puddle weld at each unit end plus either a continuous 16 gage Z welded to the top flange of the unit and to the supporting beam with 1" fillet welds at each unit end or 14 gage interior profile channels, in every other deck unit for design shears up to 700 #/LF and in each deck unit for design shears over 700 #/LF, welded to the deck with two ½" puddle welds and to the supporting beam with two 1" fillet welds at the heel of the profile channel.

Edge—1" diameter puddle or 1" long fillet welds 18" on center.

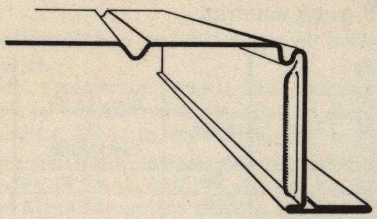
Joints—1" long fillet welds 18" on center.

Additional information for the design of LS Roof Deck diaphragms is available upon request.

"LS" deck features

integral web stiffener

In balanced design, Fenestra's web element is sufficient for shear transfer. The exclusive "web stiffener," formed as an integral part of the section, provides web strength exceeding that of two unstiffened webs of equal gage, as determined by witnessed tests, results of which are available upon request.

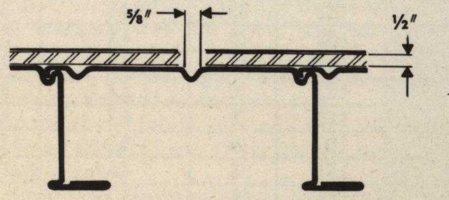


vapor permeability

Recent tests run by the engineering department of a leading University using the desiccant method of ASTM C 355-59T for the rate of water vapor transmission of LS Deck, established an average of only .25 perm. This eliminates the necessity of vapor barriers on LS Deck.

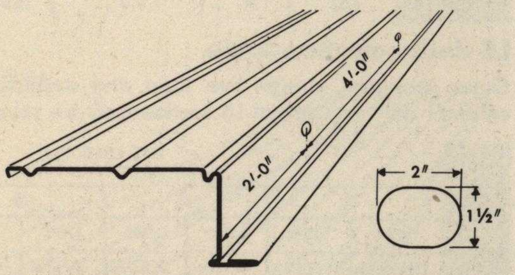
flat top plate

The top plate opening of only ⅝″ permitting the use of a minimum ½″ thickness of roof insulation, presents a supporting area of nearly 100% for the insulation and a ready flat working surface.



access holes

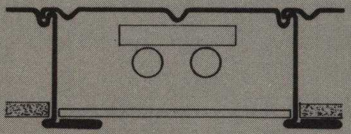
Electrical wiring perpendicular to the span of LS Deck is usually accomplished at butt joints. However, when specified, Fenestra supplies LS Deck with two access holes near one end of the unit. These afford additional access for cross-wiring and connections without extending above or below the deck structure.



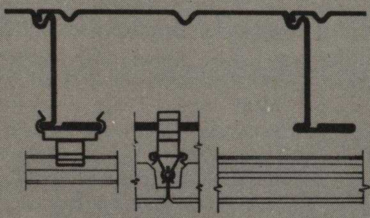
complete ceiling versatility

recessed lighting

Various types of standard fluorescent fixtures can be readily installed in the space between webs of the deck units to provide a "recessed troffer" lighting effect. Interior surfaces of deck recess may be painted white to afford greater reflectivity. The integral lower flange shelves provide ready support for the diffuser which should be positively attached to prevent unintentional dislodgement, yet allow access for maintenance.



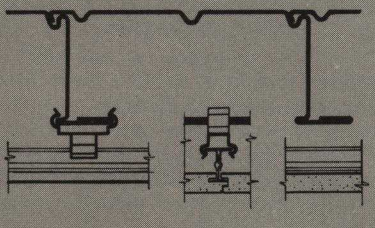
corrugated diffuser



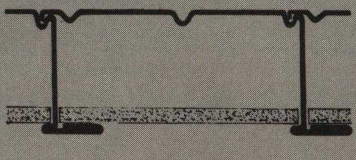
suspended metal pan

acoustical treatment

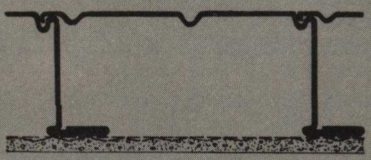
Acoustical tiles or pans offering a variety of aesthetic and color effects, may be inserted on the integral shelf of the lower flanges of the LS Deck for a finished acoustical ceiling. The resultant system, with standard acoustical units, produces a Noise Reduction Coefficient range of .70 to .80, based on tests conducted at Riverbank Acoustical Laboratories.



dense mineral fiber acoustical tile with fire resistance rating.



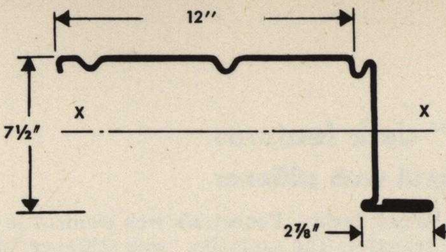
acoustical tile or board



sprayed-on acoustic fireproofing

panel section properties (per single "LS" unit)

NOTE: When specifying LS deck units, designate by depth, type and gauge. As an example 7½ LS-2—18, would indicate 7½'' depth, LS-2 type in 18 gage material.



Nominal Depth	Type	Gage	Wgt./Sq. Ft. of Deck Area	f=20,000 I In.^{4}	f=20,000 Coefficient of Deflection L/360	f=18,000 I In.^{4}	f=18,000 Coefficient of Deflection L/360	S In.^{3}	Coefficient of Strength f=20,000	Coefficient of Strength f=18,000	Web Strength Value 2'' Min. Bearing/End
4½	LS2	20	3.0	2.03	89820	2.04	89760	.75	10000	9000	1020
4½	LS2	18	3.8	2.93	128920	2.97	130680	1.05	14000	12600	2120
4½	LS1	18	4.4	3.91	172040	3.92	172480	1.34	17860	16080	2120
4½	LS1	16	5.1	5.08	223520	5.10	224400	1.69	22530	20280	3240
6	LS2	20	3.3	3.82	168080	4.01	176440	1.14	15200	13680	650
6	LS2	18	4.1	5.60	246400	5.68	249920	1.55	20670	18600	1720
6	LS1	18	4.5	7.30	321200	7.36	323840	1.90	25330	22800	1720
6	LS1	16	5.4	9.50	418000	9.54	419760	2.40	32000	28800	2840
7½	LS2	18	4.3	9.24	406560	9.36	411840	2.07	27600	24840	1320
7½	LS2	16	5.6	13.22	581680	13.32	586080	3.05	40670	36600	2440
7½	LS1	18	4.6	11.86	521840	11.93	524920	2.50	33330	30000	1320
7½	LS1	16	5.7	15.56	684640	15.62	687280	3.18	42400	38160	2440
7½	LS1	14	7.0	19.85	873400	19.93	876920	3.97	52930	47640	3960

LS deck selection table

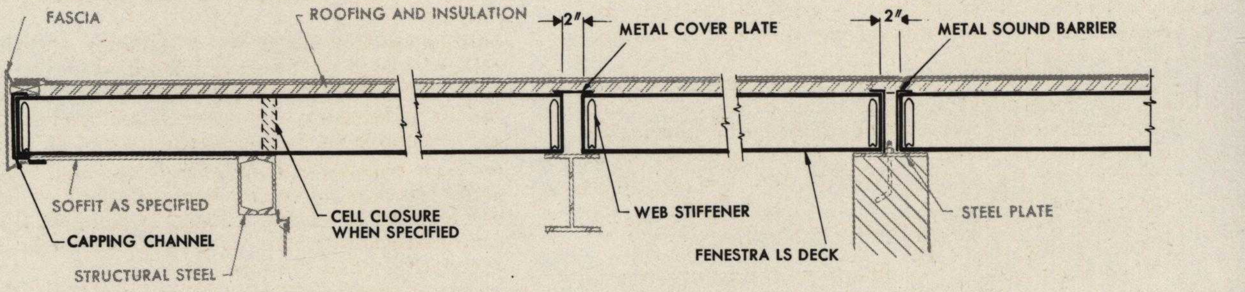
Given the span, design live load and deflection criteria, the most efficient and economical LS section may be selected from this table.

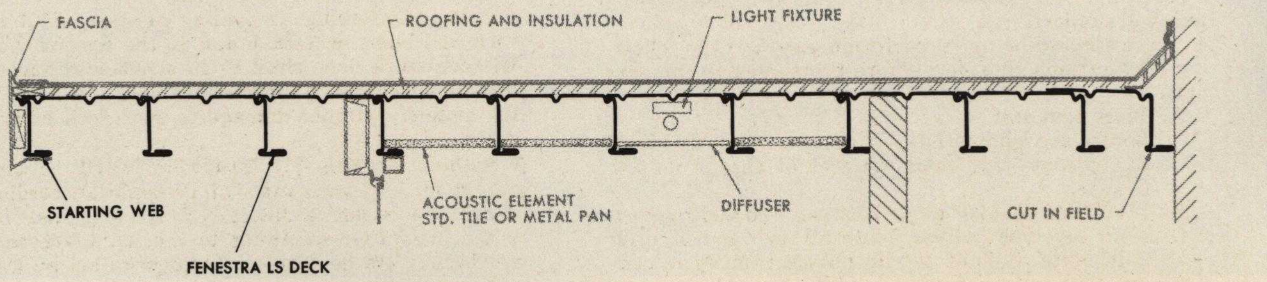
	LIVE LOAD, PSF (20,000 psi design stress)								LIVE LOAD, PSF (18,000 psi design stress)							
SPAN	20		30		35		40		20		30		35		40	
	1/240	1/360	1/240	1/360	1/240	1/360	1/240	1/360	1/240	1/360	1/240	1/360	1/240	1/360	1/240	1/360
16′	4½LS2-20	4½LS2-20	6LS2-20	6LS2-20	6LS2-20	6LS2-20	4½LS2-18	6LS2-18	4½LS2-20	4½LS2-20	6LS2-20	6LS2-20	6LS2-20	6LS2-20	6LS2-18	6LS2-18
18′	4½LS2-20	6LS2-20	6LS2-20	6LS2-18	6LS2-20	6LS2-18	6LS2-18	6LS2-18	6LS2-20	6LS2-20	6LS2-20	6LS2-20	6LS2-18	6LS2-18	6LS2-18	6LS2-18
20′	6LS2-20	6LS2-20	6LS2-18	6LS2-18	6LS2-18	7½LS2-18	6LS2-18	7½LS2-18	6LS2-18	6LS2-18	6LS2-18	6LS2-18	6LS2-18	7½LS2-18	7½LS2-18	7½LS2-18
22′	6LS2-20	6LS2-18	6LS2-18	7½LS2-18	7½LS2-18	7½LS2-18	7½LS2-18	7½LS1-18	6LS2-18	6LS2-18	7½LS2-18	7½LS2-18	7½LS2-18	7½LS2-18	7½LS1-18	7½LS1-18
24′	6LS2-18	7½LS2-18	7½LS2-18	7½LS1-18	7½LS2-18	7½LS1-18	7½LS1-18	7½LS2-16	6LS2-18	7½LS2-18	7½LS2-18	7½LS1-18	7½LS1-18	7½LS1-18	7½LS1-18	7½LS2-16
26′	6LS2-18	7½LS2-18	7½LS1-18	7½LS1-18	7½LS1-18	7½LS1-16	7½LS2-16	7½LS1-14	7½LS2-18	7½LS2-18	7½LS1-18	7½LS1-18	7½LS2-16	7½LS1-16	7½LS1-16	7½LS1-14
28′	7½LS2-18	7½LS1-18	7½LS1-18	7½LS1-16	7½LS2-16	7½LS1-14	7½LS1-16	7½LS1-14	7½LS2-18	7½LS1-18	7½LS2-16	7½LS1-16	7½LS1-16	7½LS1-14	7½LS1-14	7½LS1-14
30′	7½LS1-18	7½LS2-16	7½LS2-16	7½LS1-14	7½LS1-14		7½LS1-14		7½LS1-18	7½LS2-16	7½LS1-14	7½LS1-14	7½LS1-14		7½LS1-14	
32′	7½LS1-18	7½LS1-16	7½LS1-14		7½LS1-14				7½LS2-16	7½LS1-16	7½LS1-14		7½LS1-14			

Note: In this table the dead load was assumed to be the weight of the deck and 7 psf for insulation and built-up roofing.

construction details scale 1″ = 1′0″

only material in **black** furnished by Fenestra





specifications

1. GENERAL—All roof areas noted on the plans shall be covered with LS deck as manufactured by Fenestra Incorporated.

2. MATERIAL—LS deck shall be formed from steel sheets having a galvanized coating conforming to Federal Specification QQ-S-775a, *Class e*. Units shall be (select depth, type and gage in accordance with the following nomenclature): Examples: 4½ LS1-16, 7½ LS2-18, etc.

3. CONSTRUCTION—LS deck shall consist of a one piece, single web section, having integral stiffening ribs formed in the top flange. Deck units shall have a lower flange 2⅞″ wide to provide maximum lateral stability and an integral shelf on either side of the web for support of acoustical or light diffusing elements. At the ends of deck units, vertical stiffening ribs shall be impressed as an integral part of the webs to provide a web strength equal to or exceeding that of two unstiffened webs. The webs (shall) (shall not) (select one) have shop-punched electrical access holes for transverse passage of wiring. Side joints shall be interlocking (male-female) and continuous for the length of the section. LS deck shall have a coverage width of 12″. The sections shall be formed in 4½″, 6″ and 7½″ depth, of 20, 18, 16 and 14 USS gage steel and of types LS1 and LS2 as designated in "Material" above.

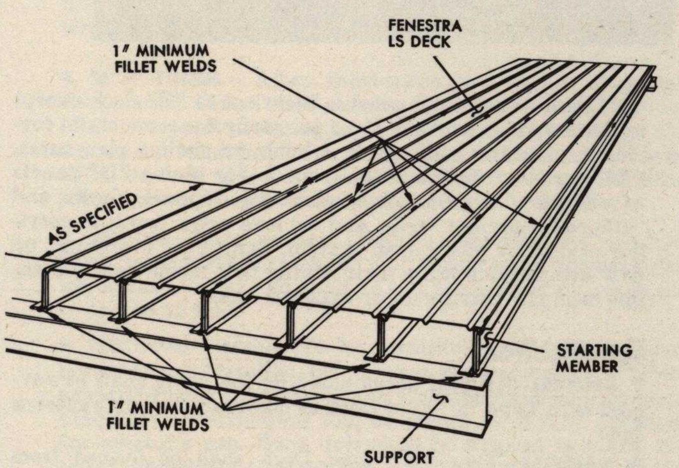
4. SHOP FINISH—Galvanized steel LS deck shall have the standard zinc coated finish without any additional shop treatment.

5. DESIGN—LS deck shall be capable of carrying the specified total loads with a maximum fiber stress not to exceed (select stress) (20,000) (18,000) psi on the actual thickness of metal. Maximum allowable deflection under roof live load shall not exceed (1/240) (1/360) of the span length. Design load (dead load + live load) shall be taken from the contract drawings without allowance for impact. Deck design is to be in accordance with the American Iron and Steel Institute's "Specification for the Design of Light Gage Cold-Formed Steel Structural Members, 1962."

LS Deck shall be capable of providing continuous bracing for the compression flange of all horizontal roof supporting members such as beams, girders, arches and trusses so that the compression flange can carry the full design stress. Welding of the deck shall be proportioned to the bracing force required.

6. ERECTION—LS deck, as manufactured by Fenestra Incorporated, is to be installed by qualified deck erector. All LS deck shall be laid in strict accordance with the manufacturer's instructions below and as shown on the layout prepared for erector's use.

1. Inaccuracies in alignment or level of supporting members shall be brought to the attention of the proper parties in writing and corrected by others before the deck is placed to insure compliance of supporting steel, plates or walls with the design drawings and deck manufacturer's layout details.
2. Starting Point—all starting points are shown on the LS Deck layout thus; ⊕
3. Weld starting web to supports with fillet welds centered at the base of bottom flange. Hold 90° angle between web and support.
4. Place succeeding units, performing each of the following 3 operations, in order, before proceeding to the next unit.
    - A. Place next unit.
      Locate the leading edge of bottom flange and weld to supports with welds centered at base of bottom flanges.
    - B. Check and hold 90° angle between web and support.
    - C. Weld top longitudinal joints at each end of deck unit. Note: Side of ½″ lip not necessarily in contact with side of female joint, since holding coverage at bottom flange and 90° angle of webs to support governs.
5. Proceed with remaining longitudinal joint, welding 2′-6″ on centers, or as otherwise specified in detail.
6. Place succeeding sheet in the initial bay in the same manner, **making certain that units are welded as they are placed.** Longitudinal joint welding can be done as each sheet is laid or after the entire deck is in place, depending on size of the job. The erector shall decide which procedure is most economical in each case.
7. LS Deck installed in adjoining bays in the same manner must be aligned, web for web, and immediately welded.
8. After welds have cooled, apply a touch-up coat of a suitable aluminum colored metal primer.
9. The treatment of end joints will vary with job requirements. The proper details for a given job will be indicated on the LS Deck layout.
10. Insert rubber void closures, where required.



7. WORK TO BE INCLUDED IN OTHER CONTRACTS

(a) Painting—The field preparation and painting of the exposed surface of the galvanized steel deck shall be covered under the General Painting Specifications.

(b) Acoustic Treatment—Furnishing and application of the acoustic treatment shall be covered under the Acoustic Specifications.

(c) Lighting—Furnishing and installation of lighting shall be covered under the Electrical, Wiring and Lighting Specifications. The electrical contractor shall inspect all LS Deck installations to determine that opening width and height dimensions are acceptable for fixture installation and diffuser attachment.

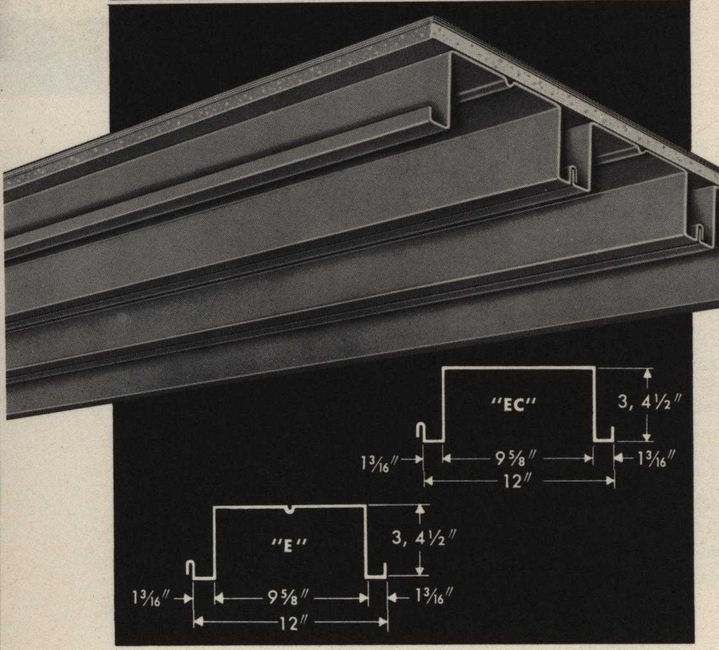
(d) Steel Framing—All structural steel and structural steel attachments required to adequately support the deck shall be furnished by others. All steel framing shall be erected in conformance with the tolerances set forth in the AISC Standard Code of Practice.

(e) Miscellaneous—All trades whose work involves the cutting of holes, reinforcing or drilling of deck, shall furnish all work and labor necessary and at the cost of those trades. All such work done shall be in strict accordance with the deck manufacturer's instructions and in a neat, workmanlike manner, without damage to roof deck units or accessories.

(f) Built-up Roofing—(1) Insulation shall be as required (minimum ½″ thick) and shall be applied according to manufacturer's recommendation. (2) Roofing shall be mopped to the insulation according to the manufacturer's recommendations (to be furnished and installed by the built-up roofing contractor).

"E" deck -

for spans 9 to 22 feet



general description ("E" deck)

A low cost, long span deck, type "E" is formed from a single sheet in lengths up to 22′-0″. The 2⅜″ void allows use of 1″ rigid roof insulation, and the integral stiffening rib adds greater compressive strength.

- **QUICK ERECTION**—"E" Deck can be erected quickly in one operation as opposed to two or three for other types of construction. Only one trade is necessary.
- **LATERAL BRACING**—"E" Deck can also be used to brace the compression flanges of structural steel beams, thus eliminating some structural steel and affording further economy.
- **HEIGHT SAVINGS**—With the 3″ or 4½″ depth of "E" Deck as opposed to 14″ or 16″ for other types of roof construction the height of the building can be reduced without sacrificing the usable internal cubage. This results in savings on collateral materials used in the structure.
- **ATTRACTIVE APPEARANCE**—A field coat of paint is all that is necessary to obtain an attractive beam type ceiling when "E" Deck is used.
- **SECTION PROPERTIES**—Interlocking, longitudinal side laps are provided on opposite edges to allow for positive side lap attachment, fastened either through welding every 4′-0″ o.c. or crimping every 3′-0″ o.c. A special crimping tool may be obtained from Fenestra Inc. upon request.

Section properties for Fenestra "E" Deck given in table may be used in conjunction with "Minimum Required Section Properties" table given on pages 12 and 13.

Depth	Gage	Wt. per Sq. Ft.	f=20,000		f=18,000		S	f=20,000	f=18,000	Web Strength Values 3″ Bearing
			I	Coef. of Deflec. L/360	I	Coef. of Deflec. L/360		Coefficient of Strength		
		Lbs.	In.⁴		In.⁴		In.³			
3	18	3.59	1.27	55880	1.30	57200	.69	9200	8280	2520
3	16	4.48	1.72	75680	1.74	76560	.89	11870	10680	3636
4½	18	4.09	3.20	140800	3.26	143440	1.20	16000	14400	2120
4½	16	5.11	4.34	190960	4.38	192720	1.55	20670	18600	3236
4½	14	6.30	5.68	249920	5.70	250800	1.98	26400	23760	4760

"EC" deck—section of panel is identical to "E" deck except stiffening rib is omitted. Used primarily for economy in corridors with drop ceilings in schools or similar structures, "EC" panels combine with Acoustic (or plain) "D" panels to provide flush roof line, eliminate support blocks and "stepped" corridor walls, and achieve extra depth in corridor cavity for mechanical system. Cantilever overhangs up to 6′ are possible while maintaining thin fascia depth, without need for outriggers or exposed steel.

specifications

1. GENERAL—All roof areas noted on the plans shall be covered with Type "E" Roof Deck as manufactured by Fenestra Inc.

2. MATERIAL—Type "E" Roof Deck shall be formed from (**select gage**) 14, 16 or 18 USS gage galvanized steel sheets conforming to Federal specifications QQ-S-775a for *Class e* and designated in the following nomenclature (insert 14, 16 or 18 for specific gage).

Example: 4½E 18 Galv.

3. CONSTRUCTION—Type "E" Roof Deck shall consist of a formed beam section with integral stiffening rib formed into the top flange. Side joints shall be interlocking (male-female) and continuous for the length of the section. "E" deck shall be 12″ in width and 3″ or 4½″ in depth and of gages designated in "Material" above.

4. SHOP FINISH—Galvanized steel "E" Deck shall have the standard zinc coated finish without any additional shop treatment.

5. DESIGN—The Type "E" Deck shall be capable of carrying the specified total loads with a maximum fiber stress not to exceed (select stress) (20,000) (18,000) psi on the actual thickness of metal. Maximum allowable deflection under roof live load shall not exceed 1/240 of the span length. Design load (dead load+live load) shall be taken from contract drawings without allowance for impact. Deck design is to be in accordance with the American Iron and Steel Institute's "Specification for the Design of Light Gage Cold-Formed Steel Structural Members."

6. ERECTION—(Roof Deck to be furnished by Fenestra Inc. and installed by deck erector.) All roof deck shall be laid in strict accordance with the manufacturer's instructions and as shown on layout prepared for erector's use. Steel deck units shall be adjusted in place before being permanently fastened and shall be accurately aligned, end to end. Inaccuracies in alignment or level of structural steel shall be brought to the attention of the proper parties in writing and corrected by others before the deck is placed. In accordance with shop details, proper bearing shall be provided at the supporting beams.

Steel deck shall be fastened to supporting beams by electric arc welding. At the butt joints, deck shall have two welds, one adjacent to each side joint; minimum length, ¾″ weld. The longitudinal side joints between adjacent units shall be fastened by welding not more than 4′ on center or riv-clinched 3′ on center. Longitudinal weld lengths shall be a minimum of ¾″. All welding shall be done by competent welders and upon cooling shall be touched up on the top surface with manufacturer's standard paint.

End joints shall be continuously sealed with the sealing member supplied by the deck manufacturer and placed in accordance with erection instructions.

7. WORK TO BE INCLUDED IN OTHER CONTRACTS

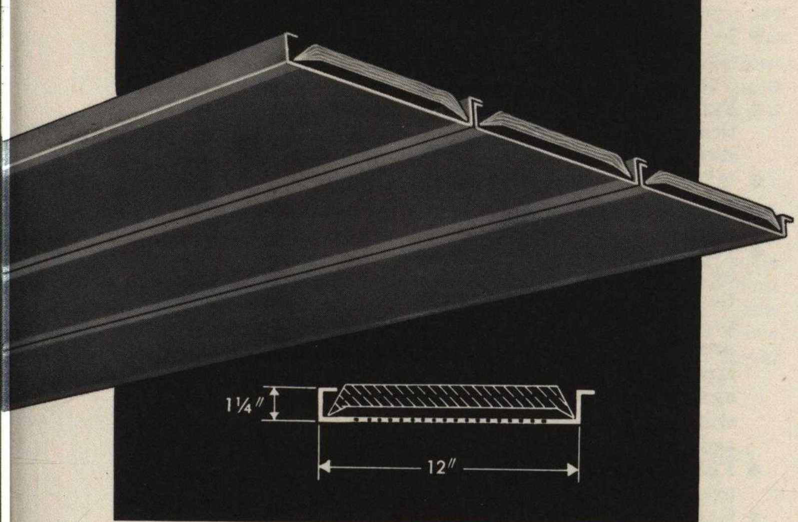
Painting—The field coats of paint to the exposed surface of the galvanized steel deck shall not be the responsibility of the deck manufacturer and shall be covered under the General Painting Specification.

Steel Framing—All structural steel and structural steel attachments required to support the deck shall be furnished by others. All steel framing shall be erected in conformance with the tolerances set forth in the AISC Standard Code of Practice.

Miscellaneous—All trades whose work involves the cutting of holes, reinforcing or drilling the deck, shall furnish all work and labor necessary. All such work done shall be in strict accordance with the Building Panel (deck) manufacturer's instructions and in a neat, workmanlike manner, without damage to roof deck units.

Built-Up Roofing—(1) Insulation shall be rigid vegetable fiber-board type roof insulation ———″ thick (minimum thickness and application based on roofers standard recommendations) to span 2⅜″ openings. (2) Built-Up roofing shall be mopped to the insulation according to the manufacturer's recommendations (to be furnished and installed by the Built-Up Roofing Contractor).

Fenacoustic plates



general description

Designed to provide a sound control system similar to Acoustic "D" panels but in areas requiring suspended ceilings, such as school corridors and other similar locations.

Plates are 12″ wide, 18 gage, path perforated and prime painted. Continuous interfitting longitudinal joints are formed on each edge by flanged upstanding legs. The sound absorbing element is a specially formed pad. As a false ceiling these plates can be placed on lower flanges of beams and trusses or across corridor areas to provide a plenum chamber for utilities. (See sectional corridor detail p. 17.) For economy, supports should be spaced from 8′ up to the 12′ maximum available length. The same path perforation pattern as on the 24″ D panel is used on these plates, effecting the same general appearance as an acoustic D panel ceiling. Fenacoustic plates are designed to carry their own dead loads, the weight of acoustic element, and a 20 pound concentrated light fixture load at mid span without exceeding L/360 deflection requirements.

fenacoustic specifications

1. GENERAL—All areas where noted on the plans shall be covered with "Fenacoustic Plates" as manufactured by Fenestra Incorporated.

2. MATERIAL—

A. "Fenacoustic Plates"—Shall be formed from 18 USS gage cold rolled steel sheets.

B. Sound Absorbing Element—Shall be an arched shape, pressure and thermally molded pad formed of glass fiber insulation having a nominal fiber diameter of .00011″.

The pad shall be so designed that the ratio of acoustic pad surface to perforated plate surface, the air space between the two, and thickness of center of pad shall produce a Noise Reduction Coefficient of .80 when tested at Riverbank Acoustical Laboratories under the testing standards of The Acoustical Material Association.

C. "U" Clips—Shall be furnished by Fenestra Incorporated and shall be used by the erector as indicated on layout drawings.

3. CONSTRUCTION—"Fenacoustic Plates" shall be channel shaped, having continuous interfitting longitudinal joints on each edge formed by flanged upstanding legs. The design of the joints shall be such that both legs have the same strength properties rendering any differential deflections of the edges, negligible. "U" clips shall be used to fasten flanges of adjacent plates together. The web or ceiling surface shall be path perforated with ⅛″ diameter holes, staggered 25/64″ on center and shall be approximately 1150 holes per square foot of perforated surface.

4. SHOP FINISH — After fabrication and before shipment, Fenacoustic Plates shall receive a coat of oven-baked, rust inhibitive paint designed to protect unexposed surfaces and act as a primer for finish treatments on exposed surfaces. (The exposed side of the section shall receive field paint after erection under General Painting Specification.)

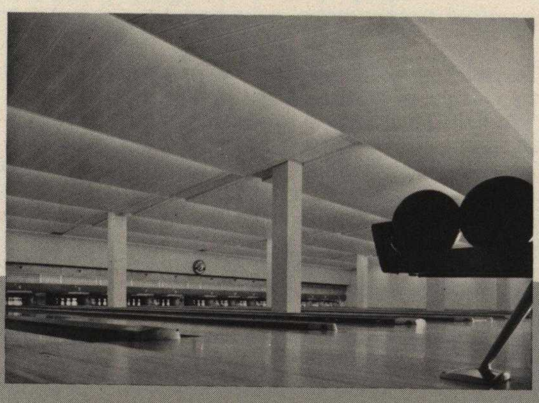
5. DESIGN—These sections shall be designed as non-load carrying acoustical ceilings (with exception of normal lighting fixture loads) and shall be self supporting on spans not to exceed 12 feet.

6. ERECTION—Plates—(To be furnished by Fenestra Incorporated and installed by general contractor.) All "Fenacoustic Plates" shall be laid in strict accordance with manufacturer's instructions and as shown on layout prepared for erector's use. Each unit shall be aligned in place, the sound absorbing element (as supplied by Fenestra Incorporated) inserted in the cell formed by upstanding legs, and the unit clipped to the previous unit before the succeeding unit is installed. Where removable plates are required to provide an access to the plenum chamber, "U" clips shall be omitted from these plates.

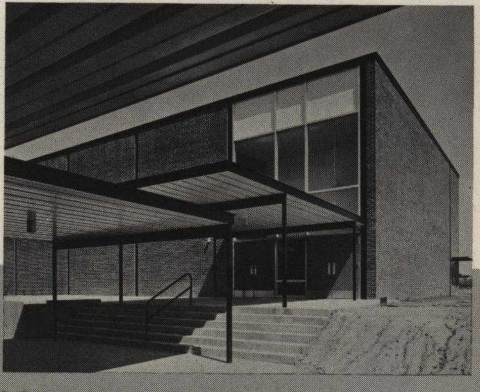
7. WORK TO BE INCLUDED IN OTHER CONTRACTS—

A. Painting—The touch-up of scuffs and abrasions due to transit or erection as well as the field paint to the exposed surface of painted steel shall be under the General Painting Specification.

B. All supporting surfaces shall be level and furnished by others than the ceiling plate manufacturer.

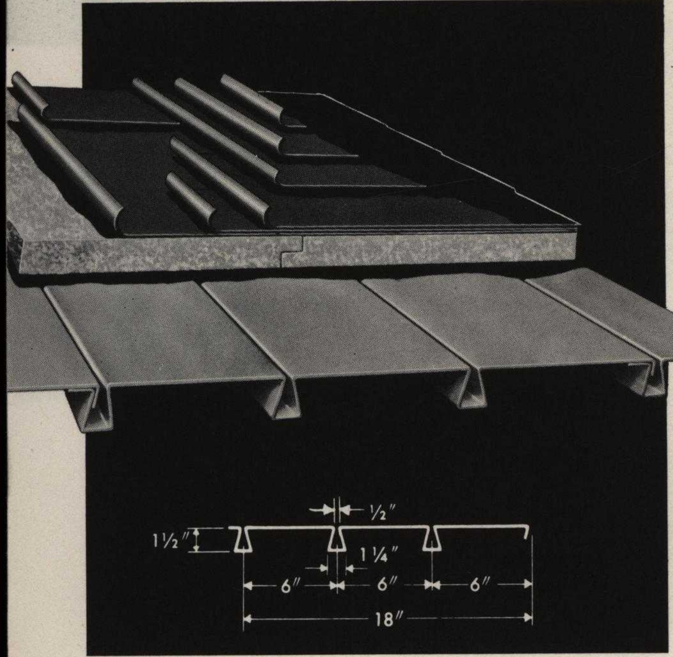


Fenacoustic
Mickey Mantle Bowling Alley, Dallas, Tex.
Archt.—Lane, Gamble & Assoc.—Dallas
Contr.—Homer A. Parks Const. Co.—Dallas



D Panels
Monroe Jr. High School, Tulsa, Okla.
Archt.—Murray-Jones-Murray—Tulsa
Contr.—Patterson Steel Co.—Tulsa

Holorib deck

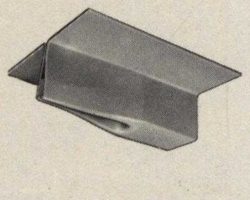


description

Holorib steel deck is a formed light gage steel structural unit which furnishes a smooth surfaced roof deck embodying the maximum number of quality features. Since its origination as the first insulated steel deck in the early twenties, the high strength, telescoping end laps, interlocking side laps, narrow rib openings, etc., have enabled Holorib to be the quality standard of steel decks. Holorib is available in hot dip and galvclad galvanized steel, and aluminum—see properties table, page 25. (For Holorib Acoustic Roofs see page 26.)

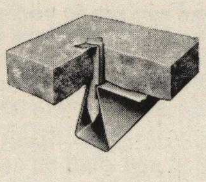
features

- Maximum length for Holorib is 35′-0″ permitting economical spacing of beams and design advantages of continuity over supports.
- Pyramidal shaped ribs provide greater lateral and vertical stability than ordinary steel deck ribs. This greater strength allows heavier loads on longer purlin spacings.
- ½″ rib opening provides full bonding area and firm support for rigid insulation as well as allowing a minimum amount of mopping waste.
- Telescoping end lap accomplished by crimping ribs at one end of the sheet to telescope them into the ribs of the adjoining sheet, provides for expansion and contraction and affords protection against dripping asphalt through ship-lapping of the sheets. Standard end lap length is 2½″. All end laps occur over purlins.

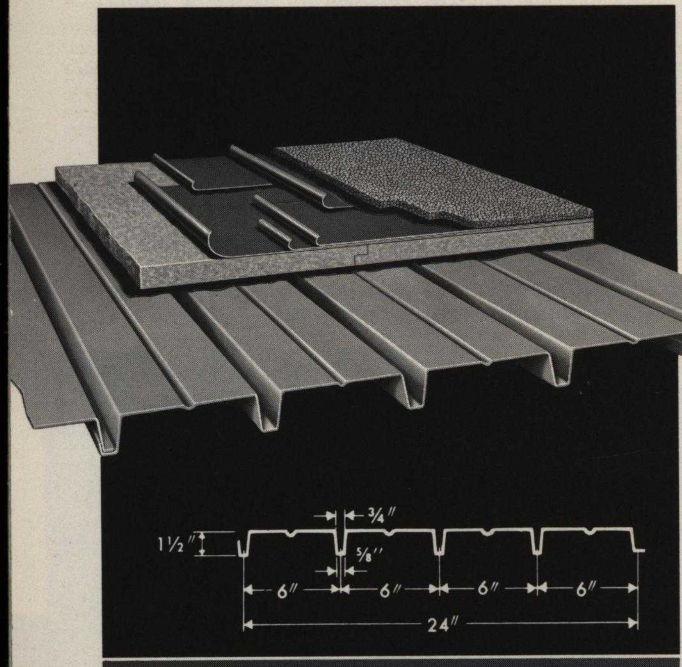


- Full 18″ coverage permits fast erection due to a large area per sheet.
- Complete last rib assures full and equal strength at all points, eliminates asphalt leakage. Interlocking Side-Laps. A full "barge strip" interlocks with the outside rib of the adjacent sheet, equalizing the level of the two sheets. The resulting side lap is smooth and permanent and allows the Holorib to conform to movements of material above it; no side lap clips are required.

- Broad 1¼″ base rests firmly on the purlin for a balanced structural section and greater welding area.
- Non-piercing insulation clip is available for use with Holorib deck only. It can be used to secure insulation laid dry, when the metal deck itself is considered to be sufficient vapor barrier, as design conditions warrant. They may also be used as a supplement with adhesives.



Econorib deck



description

Econorib steel deck is also a formed light gage steel roof deck designed to sustain normal roof loadings at minimum cost. An improvement over the ordinary vee-ribbed deck concept, Econorib provides optimum performance for those installations in which the recognized quality features of Holorib are not considered critical in design. Econorib is available in painted or hot dip galvanized steel. See properties table, page 25.

features

- "V" type ribs provide greater economy due to a reduction in the amount of steel required by this section.
- ¾″ rib opening provides adequate bonding area for the insulation.
- Full 24″ coverage permits speedier erection due to greater area per sheet.
- The ⅝″ base helps to balance the section structurally and provides satisfactory welding area.
- A last rib assures full and equal strength at all points and eliminates asphalt leakage.
- An over-lapping end joint, effected by swedging the one end of the sheet to allow the end of the next sheet to drop firmly and evenly in position.
- The maximum lengths for Econorib are 32′-6″ (painted) and 35′-0″ (galvanized), providing full continuity advantages.

design data - Holorib and Econorib

section properties

Section properties and load tables given on this page are derived in strict accordance with the specifications of the Metal Roof Deck Technical Institute. These specifications were developed from "Specifications for the Design of Light Gage Cold Formed Steel Structural Members" of the American Iron and Steel Institute, 1960 Edition.

lateral diaphragm design

Fenestra Holorib and Econorib are easily adapted for use as a roof diaphragm for the transmittal of lateral forces due to earthquake or wind forces. A series of eleven full scale tests, conducted at Cornell University by an independent consulting structural engineer, substantiate the performance of Holorib and Econorib for this usage. The table below lists lateral diaphragm design shears, in pounds per lineal foot, for the various gages of either of these two decks:

Design Shears

Deck Gage	Connection System A or C	Connection System B	Deck Gage	Connection System A or C	Connection System B
16	1160	870	20	420	310
18	740	550	22	290	220

All recommended design shear values in the above table are based on a safety factor of 3 applied to the failure shear values from tests. This is the generally accepted safety factor for use in designing light gage steel diaphragms to resist seismic action or wind. The above design shear values are applicable for all deck spans up to the maximum span for each deck unit under vertical loading.

Connections

The above design shear values are based on the following connection systems:

Type A: Standard Deck
  End & Intermediate Support Welds
    Econorib ⅜" x 1" puddle, one per rib
    Holorib ½" x 1" puddle, one per rib
  Edge Welds—Econorib ⅜" x 1" puddle, one per rib
    —Holorib ½" x 1" puddle, one per rib
  Seam Welds—1" puddle, 18" o.c.

Type B: Standard Deck—Light Welding
  End & Intermediate Support Welds
    Econorib ⅜" x 1" puddle, 2 per panel end
    Holorib ½" x 1" puddle, 2 per panel end
  Edge Welds—½" x 1" puddle, 24" o.c.
  Seam Welds—1" puddle, 24" o.c.

Type C: Inverted Deck
  End Welds—½" diam. puddle, one per rib
  Edge Welds—½" diam. puddle, 18" o.c.
  Seam Welds—1" diam. puddle, 18" o.c.

safe uniform total loads (lbs. per sq. ft.)

Holorib deck

18,000 psi design stress

Type Span	Gage	5'0"	5'6"	6'0"	6'6"	7'0"	7'6"	8'0"	8'6"	9'0"	9'6"	10'0"	10'6"	11'0"	11'6"
Simple	16	169*	140*	118	101	84	70	59	50	44	39	34			
	18	137*	113*	95	79	66	55	47	41	36	32	28			
	20	102*	85*	71	59	50	42	36	32	28	25				
	22	85*	75*	59	48	40	35	30	27						
Double	16	172	142	122	105	89	77	69	61	54	49	44	39	36	33
	18	140	106	98	84	71	62	55	49	44	39	35	32		
	20	108	89	75	64	55	48	42	38	33	30	27			
	22	91	75	63	54	46	40	35	31	28	25				
Continuous	16	214	178	152	130	111	97	86	76	68	61	55	49	44	41
	18	176	145	123	105	89	78	69	62	55	49	44	40	36	33
	20	135	112	93	80	68	60	53	47	41	37	34	31		
	22	113	94	79	67	58	50	44	39	35	31	28			

galv. steel only

20,000 psi design stress

Type Span	Gage	5'0"	5'6"	6'0"	6'6"	7'0"	7'-6"	8'0"	8'6"	9'0"	9'6"	10'0"	10'6"	11'0"	11'6"
Simple	16	188*	156*	125	100	84	70	59	50	44	39	34	31		
	18	147*	119*	97	79	66	55	47	41	36	32				
	20	110*	91*	71	59	50	42	36	32						
	22	90*	71	59	48	40	35	30							
Double	16	192	158	135	117	99	85	77	68	60	54	49	44	40	36
	18	156	129	109	93	79	69	61	54	49	43	39	35	32	30
	20	120	99	83	71	61	53	47	42	37	33	30			
	22	101	83	70	60	51	44	39	34	31					
Continuous	16	240	198	169	144	123	108	95	84	75	68	61	54	50	46
	18	195	161	137	117	99	87	77	69	61	54	49	44	40	37
	20	150	124	103	89	75	67	59	52	46	41	38	34	31	
	22	126	104	88	74	64	56	49	43	39	34	31	29		

galv. steel only

*Stress governs. All remaining simple span values governed by L/240 deflection criterion.

Econorib deck

18,000 psi design stress

Type Span	Gage	5'0	5'6	6'0	6'6	7'0	7'6	8'0	8'6	9'0	9'6	10'0"
Simple	18	101	83	70	60	51	45	38	33	30		
	20	75	62	52	44	38	33	29				
	22	61	50	42	36	31						
	24	43	36	30								
Double	18	104	86	72	62	53	46	41	36	32		
	20	78	64	54	46	40	35	31				
	22	66	54	46	39	34	29					
	24	51	42	35	30							
Continuous	18	130	107	90	77	66	58	51	45	40	36	32
	20	98	80	68	58	50	43	38	34	30		
	22	82	68	57	49	42	37	32				
	24	64	53	44	38	32						

20,000 psi design stress

Type Span	Gage	5'0	5'6	6'0	6'6	7'0	7'6	8'0	8'6	9'0	9'6	10'0"
Simple	18	101	91	76	64†	53†	45†	38†	33†	30†		
	20	80	66	55	47	39†	34†	29†				
	22	65	54	45	38	33						
	24	48	40	33								
Double	18	115	95	80	69	59	51	46	40	36	32	29
	20	87	71	60	51	44	39	34	30			
	22	73	60	51	43	38	32					
	24	57	47	39	33	29						
Continuous	18	144	119	100	85	73	64	57	52	44	40	36
	20	109	89	75	64	56	48	42	38	33	30	
	22	91	75	63	54	47	41	36	32			
	24	71	58	49	42	36	32					

†L/240 Deflection Governs

Notes for Holorib and Econorib Load Tables:

Loads listed in the tables are based on a governing stress criterion of either 20,000 or 18,000 psi on actual thickness of metal or a deflection criterion of 1/240th of span. For Holorib, all simple span loads are governed by deflection, except as noted with*. For Econorib, only those loads noted with dagger are governed by deflection. If deflection is not critical, the simple span allowable loads may be increased by computation. All load values have been determined in strict accordance with The Metal Roof Deck Technical Institute's specifications and A.I.S.I. design procedures.

The above values are total loads. An allowance of 9 #/sq. ft. for the dead load of the deck, insulation and built-up roofing should be added to live loads and compared against the tables above.

Aluminum Holorib

Type of Span	Live Load PSF 20#	30#	40#
Simple	7'-0"	6'-0"	5'-6"
Double	8'-0"	7'-0"	6'-0"
Continuous	8'-6"	7'-0"	6'-6"

All simple spans predicated on L/240 deflection criteria. All double and continuous spans on 9,500 psi stress allowance.

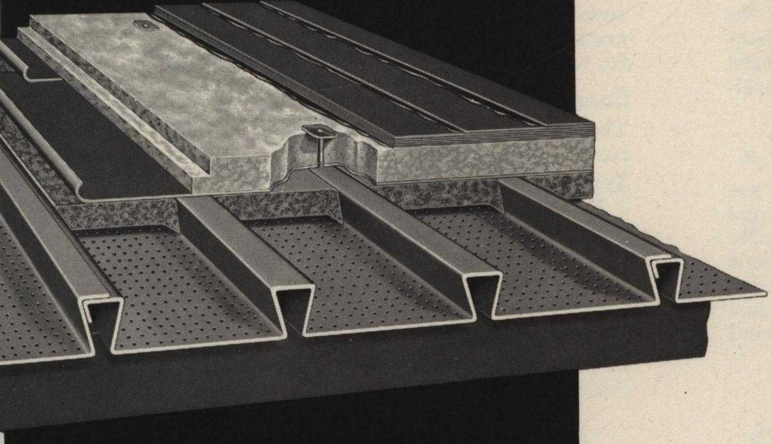
section properties

deck type	gage	section modulus in.^{3}	moment of inertia in.^{4} 18,000	moment of inertia in.^{4} 20,000
Holorib—steel	16	.353	.389	.383
	18	.286	.296	.289
	20	.213	.212	.201
	22	.177	.165	.156
Holorib—aluminum**	16 B & S	.289	.276	
Econorib—steel	18	.210	.229	.223
	20	.156	.163	.159
	22	.127	.125	.118
	24	.090	.090	.088

**For aluminum Holorib
$f_a = 9{,}500$ psi
$E_a = 10.3 \times 10^6$ psi

See aluminum span table at left.

Holorib acoustic roofs



general description

The original member of the family of Fenestra acoustical systems, Holorib Acoustic Roofs offer the designer another ideal solution for economical handling of noise control. In use for over 30 years, this combination of the highest quality roof deck with scientifically tested acoustical treatment continues to increase its application in structures of contemporary design.

Acoustic Holorib is formed by perforating the flat portion of Holorib with ⅛″ round holes, approximately 1150 per square foot. A sound absorbing element of a formed arched pad, 1″ thick, molded from 1 lb. density extra fine glass fibers, is placed between ribs. A ply of roofing felt is laid dry over the tops of the exposed ribs and sound absorbing element, to form a vapor seal and asphalt stop. For bonded roof construction 1½″ of rigid insulation is then mechanically fastened to the ribs. The roof is then weather-proofed by the highest grade of built-up roofing. Further economy can be obtained by using an alternate system of acoustic Holorib and inverted plain Holorib deck.

Acoustic Holorib is available only in Hot Dip Galvanized Steel.

advantages

- Holorib Acoustic Roofs combine these four elements—
  - **a.** Structural support for live load and built-up roof.
  - **b.** Perforated steel deck for rugged acoustical ceiling.
  - **c.** Efficient sound absorbing properties.
  - **d.** Superior thermal insulation roof value—0.12 BTU/Hr/Sq. Ft./°F.
- Holorib Acoustic Roofs are easily and speedily erected.
- Holorib Acoustic Roofs can be maintained with soap and water and repainting without affecting acoustic efficiency.
- The roofs are of incombustible construction.

sound absorption tests

The following are results of tests conducted at the Riverbank Acoustical Laboratories.

Type	Frequencies						
	125	250	500	1000	2000	4000	NRC
			Coefficients				
Acoustic Holorib Test No. A-56-79	.33	.59	.88	.90	.76	.64	.80
Acoustic Holorib Alternated with Standard Holorib Test No. A-58-283	.46	.46	.61	.68	.49	.39	.55

maximum span table (Acoustic Holorib)

Type Span	Gage	Live Load—PSF		
		20	30	40
Simple	16	10′-6″	9′-6″	8′-6″
	18	10′-0″	8′-6″	8′-0″
	20	9′-0″	7′-6″	7′-0″
	22	8′-0″	7′-0″	6′-6″
Double	16	11′-6″*	10′-0″	9′-0″*
	18	10′-6″	9′-0″*	8′-0″
	20	9′-0″	7′-6″	7′-0″
	22	8′-0″	7′-0″	6′-6″
Continuous	16	10′-6″•	10′-6″•	10′-0″
	18	10′-6″•	10′-0″	9′-0″
	20	10′-0″	8′-6″	7′-6″*
	22	9′-0″	8′-0″	7′-0″

NOTE: All simple spans governed by 1/240 deflection criteria.

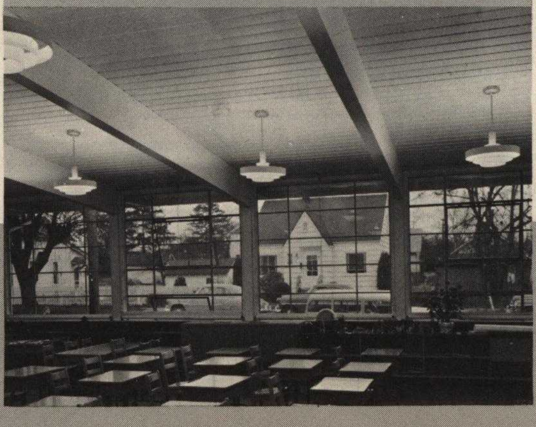
All double and continuous spans governed by either 18,000 psi or 20,000 psi design stress except as noted:

*For 20,000 psi stress maximum span may be increased by 6″.

•Maximum available sheet length (painted) governs. If galvanized, maximum span may be increased by 1′-0″ for 20 psf live load or 6″ for 30 psf live load.

Holorib
Las Vegas Convention Center, Las Vegas, Nev.
Archt.—Adrian Wilson & Assoc., Los Angeles, Calif.
Contr.—Lembke Constn. Co. of Nevada, Las Vegas

Acoustic Holorib
Horace Mann School, Tacoma, Wash.
Archt.—Jasen & Mills, Tacoma, Wash.
Contr.—Bona-Fide Builders, Tacoma, Wash.



specifications Holorib, Econorib, Holorib acoustic, Holorib Re-Form

roof deck

1. GENERAL—All roof areas noted on the plans shall be covered with **(select Holorib or Econorib)** Roof Deck as manufactured by Fenestra Inc.

2. MATERIAL

a. Holorib Deck shall be formed from (**select gage**) 16, 18, 20 or 22 USS Gage Steel sheets conforming to ASTM Standard A-245 or A-246 having a galvanize coating conforming to (select coating) (Federal Specification QQ-S-775a *class e*) (the manufacturer's standard Galvclad finish).

b. Econorib deck shall be formed from (**select gage**) 18, 20, 22 or 24 USS gage steel sheets (or for 20 gage copper bearing steel sheets containing from .20 to .25% copper) conforming to ASTM Specification A-245 or A-246, or having a galvanized coating conforming to Federal Specifications QQ-S-775a *class e*.

3. CONSTRUCTION (Select **a** or **b**)

a. The Holorib deck shall have integral pyramidal shaped ribs, all continuous and complete in cross section, spaced not more than 6″ on center. Ribs shall be formed to a depth of not less than 1½″, with an opening of not more than ½″ at the apex and a width of not less than 1¼″ at the base. Sheets shall be so fabricated as to permit telescoping end-laps not less than 2½″ long. Side-laps shall be of the interlocking type made by inserting the flanged (barge) side of the sheet into the complete outside rib of the adjoining sheet.

b. The Econorib steel deck shall be of open rib design, all ribs being continuous and complete in cross sections, spaced not more than 6″ on center. Ribs shall be formed to a depth of not less than 1½″, with an opening of not more than ¾″ at the apex and a width of not less than ⅝″ at the base. Side-laps shall be of the nesting type made by inserting the flange (barge) side of the sheet into the complete outside rib of the adjoining sheet. End-laps shall be not less than 2″ long.

4. Shop Finish (Select applicable finish)

a. (Select deck) (Holorib) (Econorib) fabricated of steel having a galvanize coating conforming to Federal Specification QQ-S-775a *class e* shall be without any additional shop treatment.

b. Holorib Deck fabricated of steel having a galvanize coating conforming to the manufacturer's standard Galvclad finish shall be without any additional shop treatment.

c. Econorib deck shall, after fabrication and before shipment, receive a dipped on, oven baked, coat of priming paint to act as a protection to the deck in transit and to serve as a base for field painting of the exposed side.

5. DESIGN—Roof decks shall be capable of carrying the specified total loads with a maximum fiber stress not to exceed (select stress) (18,000 psi) (20,000 psi) (16 gage aluminum 9,500 psi) on actual thickness of metal.

Maximum allowable deflection under live load shall not exceed 1/240 span length. Design load (dead load and live load) shall be taken from contract drawings without allowance for impact unless specified. Panel design shall be in accordance with the American Iron and Steel Institute's "Specification for the Design of Light Gage Cold Formed Structural Steel Members, 1962."

The top of the deck shall form a virtually flat and continuous surface for the complete support of insulating material. The finished deck shall have sufficient strength to carry all specified roof loads over the designed purlin spacings without excessive or permanent deflection.

The finished deck shall be so constructed as to prevent the flow of bitumen through the joints.

6. ERECTION

a. Holorib Erection—The deck shall be fastened to supporting steel by electric arc welding. The first course of sheets shall be secured by welding the first and third ribs to the supports at both ends of each sheet. Each succeeding course of sheets shall have the crimped ends of the ribs driven into the open ends of the preceding course of sheets, forming a telescoping end-lap, and the non-crimped end of the sheet welded to the support at the first and third ribs. Where deck is continuous over supports, the second rib is to be plug-welded at each intermediate support. All welds shall be sound and shall be done by competent welders and, upon cooling, shall be given a touch-up coat of paint.

b. Econorib Erection—The deck shall be fastened to the structural steel by means of electric arc welding. All welds are to be sound and placed in the following pattern:

For spans 5′-0″ and over, the first and third ribs of each sheet shall be welded to each support. End welds at laps shall be made after the next sheet is in place and shall be made plug-welded through both sheets. The barge strip of succeeding sheets shall be welded to the last rib of preceding sheets at midspan.

For spans under 5′-0″, the first and third ribs of each sheet shall be welded to every other support, beginning with the support at the crimped end of each sheet. The second or fourth ribs of each sheet shall be welded to the remaining supports, in a staggered pattern. End welds at laps shall be made after the next sheet is in place and shall be made plug-welded through both sheets.

All welds shall be touched up on top surface with paint.

7. WORK TO BE INCLUDED IN OTHER CONTRACTS

a. Built-Up Roofing—

1. Insulation—Insulation shall consist of a minimum of ½″ of rigid board insulation and shall be applied according to the manufacturer's recommendations.

2. Built-Up Roofing—Twenty year bonded built-up roofing of (1) pitch, felt and slag (2) asphalt, felt and slag (3) asphalt or asbestos smooth surface shall be applied according to the manufacturer's specifications.

b. Painting—The touch-up of scuffs and abrasions due to transit or erection, the touch-up of charred points on the underside of the welds, as well as the field coats of paint to the exposed surface of painted steel or galvanized steel panels, shall be under the General Painting Specifications.

Holorib acoustic roof units

1. GENERAL—All roof areas noted on the plans shall be covered with Holorib Acoustic Roof Units, designed by Fenestra Inc. This Roof Deck shall have a sound reduction coefficient of not less than .80.

2. MATERIAL

a. Steel Deck—Deck shall be formed from steel sheets having a galv. coating conforming to Federal Specification QQ-S-775a *class e* of 16, 18, 20 or 22 USS gage as determined from maximum span table.

c. Sound Absorbing Element—Sound absorbing elements shall be an arched shape, pressure and thermally molded pad formed from glass fibers having a nominal fiber diameter of .00011″.

d. Sound Barriers—Sound barriers shall be designed and furnished by Fenestra Inc. wherever airborn sound transmission can occur through the deck cells. The barrier shall be fabricated from 4¼ # density glass fiber insulation and shall be shaped to fit the configuration of the cell.

e. Insulation Clips—Insulation clips shall be a steel piercing type furnished by Fenestra Inc. Fifty clips shall be used per square, or 4 per standard 2′ x 4′ sheet of insulation. Clips shall be placed 4″ from each long side and into flat surface of ribs adjacent to those ribs over which insulation sheets join.

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Cleveland 11, Ohio . 3665 West 117th St., Suite No. 3
Dallas, Texas . . . . . . 2331 Gus Thomason Rd., Room 110, P.O. Box 28156
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Kansas City, Mo. . . . . 5926 Troost
Lansing 15, Mich. . . . 506 North Washington Ave.
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Pittsburgh 22, Pa. . . . . .411 — 7th Ave., Chamber of Commerce Bldg.
Reading, Pa. . . . . 64 Morgantown Road
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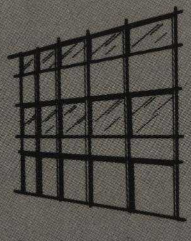
FENCAL, INC.

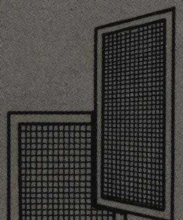
Los Angeles 22, Calif. . . . . . 6424 Bandini Blvd.
Oakland 8, Calif. . . . . 6355 Hollis St.

For your further design needs, we suggest you refer to the following catalogs on other related Fenestra building products in Sweet's Architectural File:

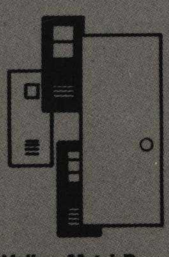
Curtain Wall Systems........**Section 3b**
Guard Screens..............**Section 18a**
Hollow Metal Doors.........**Section 16b**



Curtain Wall Systems



Guard Screens



Hollow Metal Doors

Fenestra
INCORPORATED

General Office
11801 Mack Avenue • Detroit 14, Michigan

Architectural Products Division
220 Delaware Avenue • Buffalo 2, New York

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